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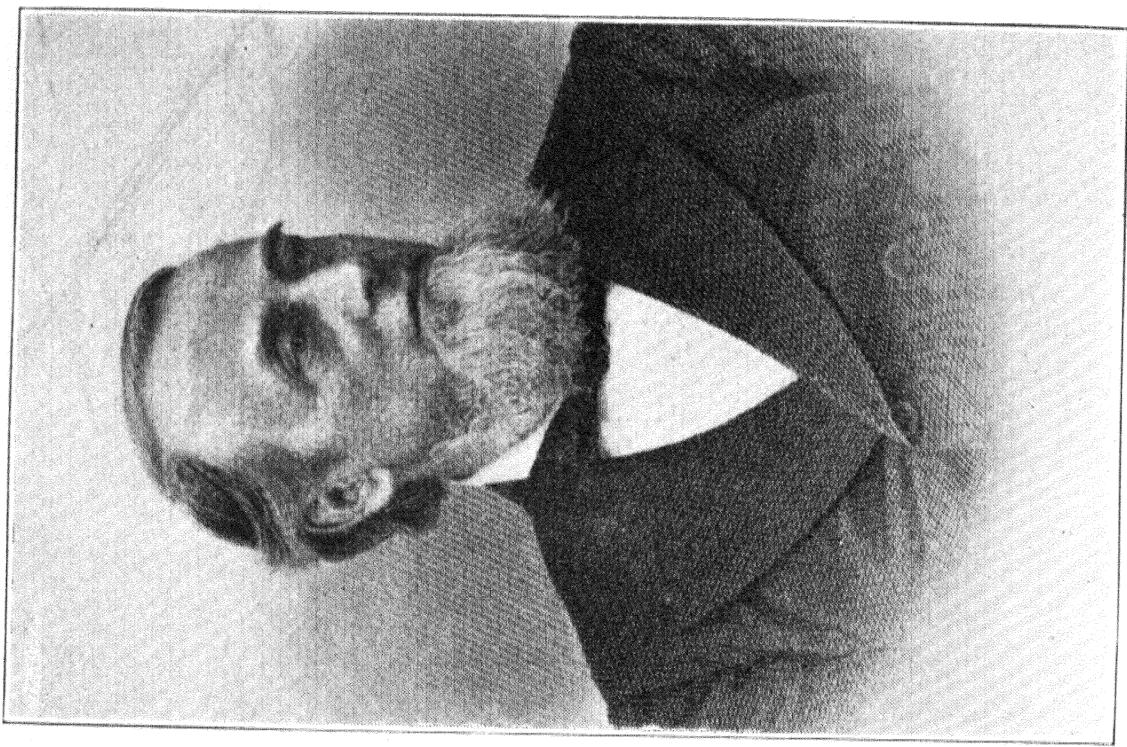
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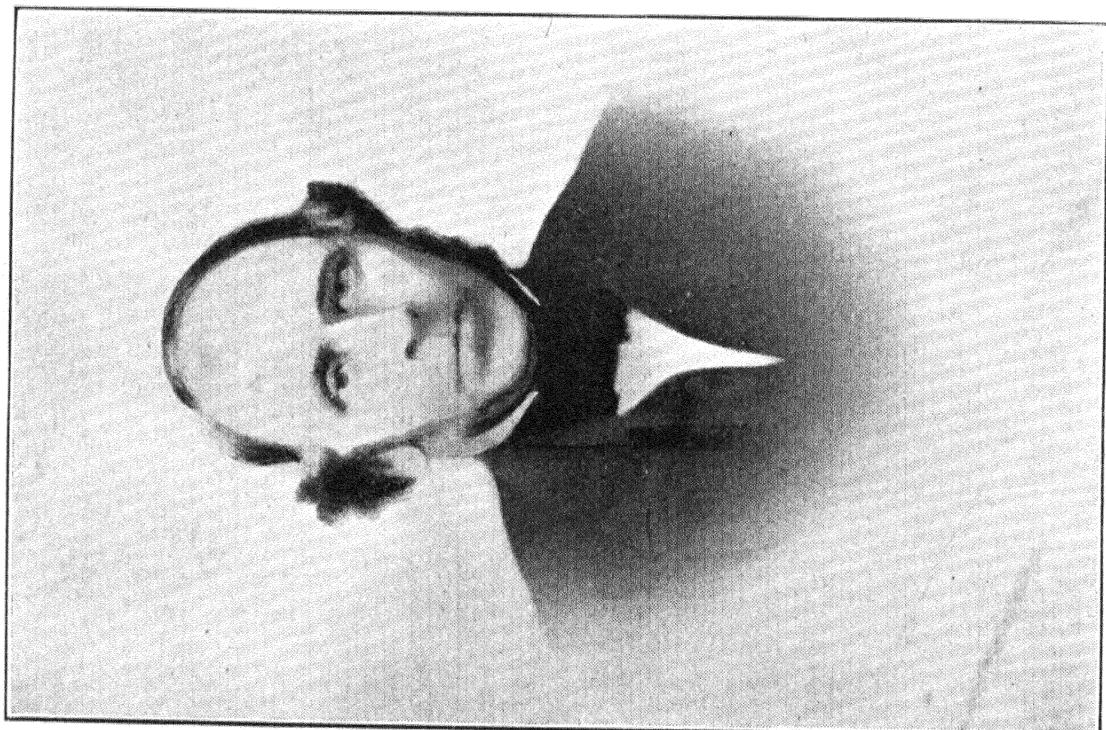
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THE AMERICAN
WOOL MANUFACTURE
VOLUME II



LUCIUS J. KNOWLES

Sharer with William Crompton in the development
of weaving equipment for the wool manufacture



WILLIAM CROMPTON

The inventor of weaving apparatus which laid the
basis for much of the subsequent development in
wool-weaving devices

THE AMERICAN WOOL MANUFACTURE

BY

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VOLUME II



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THE AMERICAN
WOOL MANUFACTURE
VOLUME II

PART IV
INDUSTRIAL MATURITY

INTRODUCTION

THE earlier chapters in the history of the American wool manufacture have failed of their purpose if they have not prepared us for a critical estimate of the domestic industry in its present condition, when the household manufacture and the primitive factory have given way to the modern, highly organized enterprise. In the first part our attention was directed to the rudimentary organization of the colonial period, — an organization characterized by household production, by little trade in woolen products, and by a meager range of manufactured fabrics. The following part was devoted primarily to a consideration of the conditions precedent to the rise of factory production, and of the course by which this rise took place. Accompanying this development were a marked improvement in technical equipment, a broadening of the market, and some extension of the range in output. Then, the survey of the industry as of about 1870 showed the industry in the midst of its rapid expansion. It already gave indication of the direction in which the modern manufacture was destined to advance. The woolen cloths produced had largely taken on their present character, and a beginning had been made in the worsted manufacture. Technique had improved, especially in weaving. The commencement of the wholesale clothing industry had supplied a new foundation for a growing domestic market. But the geographical dispersion of the industry, the moderate size of the typical establishment, and certain features connected with the quality of the goods, indicated that the industry was as yet immature. Particularly youthful in appearance as compared with modern organization was the worsted branch.

Accordingly, in considering the industry of the present day, — picking out the essential and more significant features, — we should attend most closely to those factors which, revealing a

change from the conditions fifty years ago, indicate a movement in the direction of greater maturity for the whole industry. To the outline of such changes this part will be devoted, although in this choice of emphasis many interesting topics must be subordinated or wholly ignored.

CHAPTER XXII

THE TARIFF AND THE DOMESTIC INDUSTRY

EVEN to the casual observer, the conditions surrounding the wool manufacture in the years after the Civil War were different in many ways from those which compassed it in the earlier decades; and perhaps no change between such periods was more obvious than that with respect to tariff matters. The later forties and the fifties covered the low-tariff era in American experience, while the years after the war saw the launching of the high-tariff system which for the wool manufacture has prevailed ever since with only short lapses. Indeed, even the tariff law of 1922 shows in its very form and method, as far as the wool and woolens schedule is concerned, the influence of the development in tariff structure which had come during the earlier sixties and was solidified in the Wool and Woolens act of 1867. In height of duties, too, the course of rates in the successive laws has generally been upwards. At least there have been no serious reactions, except under the Wilson act (1894-1897) and under the Underwood law (1913-1922), when the number of normal years were too few to influence appreciably the development of the manufacture itself. For this reason, as well as for the prominence which the wool and woolens schedule has attained in recent tariff discussions, the form and substance of the protection under the so-called Republican laws will engage our first attention.¹

¹ At the outset of this discussion, I would make perfectly plain its aim and purpose. As I suggested in the Preface, I am not concerned here or elsewhere in this study in passing judgment upon the wisdom or usefulness of the tariff policy which has been applied to the wool-manufacturing industry. Others have done this much better than I could hope to do, notably Professor Taussig in his *Tariff History* and his *Some Aspects of the Tariff Question*. What I do want to point out is the effect of the whole tariff policy and even of the manner in which that policy has been carried out in the schedules of the several tariff acts upon the development of the manufacturing industry itself. Without any impropriety in the formulation of the effective duties and without exceptional long-run profits on the part of any particular section of a given manufacture, protection may induce changes in the course of an industry's growth. And it is with this function of the tariff, — as an important force in the directing of industrial development, — that I am here interested.

The matter of tariff form has more than a passing interest for those concerned with the wool and woolens paragraph of the several laws. The scheme of the Republican tariff schedules relating to these articles has a peculiar nature and a peculiar history. It rests upon a compounding of interests, — the separate and possibly antagonistic interests of wool-grower and wool-manufacturer. The wool-grower has demanded tariff protection, — on what grounds and with what propriety we need not here consider,¹ — and the grant of aid to him would necessarily mean higher wool prices to the wool-manufacturer. Unless the latter's position be in some manner alleviated, he is exposed through such an increase in his raw-material costs to enhanced competition from foreign manufacturers who, of course, secure their wool at the lower world prices. This difficulty, of course, occurred in the period before the Civil War, and tariff-makers attempted to solve the problem usually by varying the rates of duty between raw material and finished fabrics. Thus, in the act of 1816, when raw wool was first taxed upon importation, the duty upon it was 15 per cent ad valorem, while that on cloth, dress-goods, and flannels was 25 per cent. Again, the law of 1842 carried rates of 3 cents per pound plus 30 per cent ad valorem on the wool, and of 40 per cent ad valorem on cloths and dress-goods. The net protection for the benefit of the manufacturers obviously proceeded on no clear-cut theory. They secured an indefinite something after the wool-growers had been taken care of; and the manufacturers were dissatisfied with such a fast and loose arrangement. The result was especially unpleasant when, in the long-continued act of 1846, the raw wool and the manufactured cloths and dress-goods were dutied at the same rate (30 per cent); and when flannels and blankets fared even worse in that tariff, being taxed at 25 and 20 per cent, respectively, despite the higher wool duty.

The remedy was sketched in the Morrill tariff of 1861. Wool under that act was dutied under a system of steps: fiber valued at less than 18 cents a pound bore a 5 per cent rate; that valued between 18 and 24 cents was taxed 3 cents a pound; and that

¹ See Wright, *Wool Growing and the Tariff, passim.*

valued above 24 cents, 9 cents a pound. In framing the tariff on wool manufactures, the scheme was hit upon of combining a specific duty, to compensate the domestic user of foreign wool for the higher cost of his raw material, and an ad valorem duty which should represent the pure protective element. Just where this idea came from is not clear; but once established it proved to have extraordinary vitality.¹ In the Morrill tariff, however, the full significance of the principle does not seem to have been appreciated, nor its full application attained. The duty on cloths and dress-goods was placed at 12 cents per pound plus 25 per cent ad valorem; but just how the figure of 12 cents was arrived at, is not apparent. Probably it was related to the 3-cent duty on wool valued at 18 to 24 cents per pound, — a duty applied to the most important group of wools employed in the American industry, — with allowance for four pounds of raw wool per pound of cloth. Moreover, the system was not used in connection with the duties on yarns or flannels, — except for the higher values of yarns. However, the succeeding tariffs, 1862 and 1864, revealed a wider employment of the basic notion, while in the postwar act of 1867 this concept prevailed throughout the law and was applied with greater exactness.

The duty on clothing wools costing not more than 32 cents a pound — a limit which embraced the chief constituents in the imported wool supply — was by the act of 1867 placed at 10 cents per pound plus 11 per cent ad valorem. This compound rate meant an actual one of about $11\frac{1}{2}$ cents per pound. With this as a starting point, the specific rate, say, for cloths was fixed by the following computation:

Compensation for duty on 4 pounds of wool at $11\frac{1}{2}$ cents	46	cents
Compensation for duties levied on oils, dye-stuffs, etc.	$2\frac{1}{2}$	"
Interest on moneys advanced to pay these duties	$4\frac{1}{2}$	"
Total	53	"

¹ The suggestion of this arrangement apparently did not come from the manufacturers. At least the tariff of 1861 did not generally have the support of the country's industrial interests. Mr. Morrill himself is on record as saying that that law "was not asked for, and but coldly welcomed, by manufacturers" (*Congressional Globe*, 1869-1870, p. 3295). See also Taussig, *Tariff History*, p. 159, note.

Congress as a matter of actual fact whittled this figure down to an even 50 cents a pound; but in substance the principle was admitted. To this specific duty an *ad valorem* one was added — 35 per cent — which was intended to convey the “net effective protection.”¹ For other manufactured articles, dress-goods, yarns, blankets, or flannels, computations similar in method to that above for cloths gave the basis for specific duties which were supposed to be wholly compensatory in character; while generally throughout the schedule an *ad valorem* duty of 35 per cent was added for simple protectionist purposes.

However, the processes of computation used to arrive at the height of the specific duties deserve further analysis. The indemnification to manufacturers for duties paid on oils, dye-stuffs, etc., need not detain us; the figure is not a large one. Nor need one cavil at the item for interest. The selection of “four pounds of wool” as the proper ratio between raw wool and finished fabric is the most important point. This ratio, it may be explained, assumes that the loss in weight in the manufacturing processes renders necessary the employment of four pounds of greasy wool to secure one pound of cloth. Of the loss so incurred, the chief is that sustained in the scouring process, where the wool grease, dirt, and other substances are removed from the wool fibers. This so-called “shrinkage” of raw wool varies widely among the manifold different types of wool fleeces, from 20 or 25 per cent to $66\frac{2}{3}$ or even 75 per cent. The ratio selected for tariff purposes obviously was based upon a shrinkage of the maximum or nearly the maximum degree, even making allowance for the wastage, small in proportion, in the real manufacturing processes. The intent of the system built upon this ratio has this general scope: to place the American manufacturer in a position enabling him to employ practically any staple of the

¹ More accurately, the 35 per cent was intended to include two elements, a 25 per cent for real protective purposes, and a 10 per cent to compensate domestic producers for internal taxes. Yet these internal revenue taxes were much reduced by a law approved under the same date as the tariff act, and were wholly wiped away in about a year's time; and still the *ad valorem* rate in the tariff was not reduced. In substance, then, the 35 per cent was wholly protective in operation.

world's production upon equal terms with his foreign competitor, i. e., without prejudice by reason of the protection afforded the American wool-grower.

The practical working out of this principle, it may be remarked, led to conclusions which are quite startling. For example, let us take the relation of the ratio to the domestic wool production. In the early years of operation under the new system, the American cloth manufacturers were almost entirely dependent upon the American clip. Thus, in the years 1868-1870, an average of less than 4 million pounds of "clothing" wool was imported, while the domestic wool production was around 165 million pounds (almost wholly wools for clothing purposes).¹ Yet, as one of the theory's exponents puts it, "It must be remembered that this basis (four-to-one) has no relation whatever to domestic wools: it relates only to foreign wools, and is made only to place the American manufacturer, in the use of foreign wools burdened by a duty, on an equality with the foreign manufacturer, in the use of foreign wools free of duty."² However, when that notion has been embraced, we are surprised to learn that these heavy-shrinking foreign wools for the use of which our manufacturers must be compensated are, in fact, wools "from the use of which they (the manufacturers) are practically debarred."³ And,

¹ Statistics relating to the period before 1867 would show better the situation as it confronted the drafters of the 1867 act; but only in the later years can we separate the wools into the several classes of "clothing," "combing," and "carpet" varieties.

² Hayes, "Remarks made before the Tariff Commission on introducing a schedule of duties on woolens," *Bulletin*, 1883, p. 3. See also *Bulletin*, 1890, p. 259: "The American manufacturer must be reimbursed on the basis of the shrinkage of the wools used by his foreign competitors, or available for the latters' use."

It is only fair to add that in later years, with the increased domestic demand for wool and a rather stationary domestic supply, the importance of the foreign wool imports was much enhanced.

³ North, *Bulletin*, 1894, p. 9. He continues: If the domestic manufacturers "are driven to the use of other wools, — costlier wools of lighter shrinkage, — they must still be compensated to the extent of four pounds, or they are at a disadvantage as compared with manufacturers who can and do use these heavier and cheaper wools."

See also *Bulletin*, 1884, p. 281; *ibid.*, 1890, p. 421; and *ibid.*, 1897, p. 129.

truly, the effect of the very laws providing compensation for manufacturers has been to encourage them in the use of wools of lower shrinkage. For example, in Australian wool centers, merino wools of relatively low shrinkage are frequently spoken of as "wools for the American market." Rather than pay a substantially high tax (and freight) upon wool grease and dirt, domestic wool manufacturers and merchants have found it advantageous to pay a premium, if not too great a one, upon wools of lighter shrinkage.¹ Mauger and Avery, one of the largest wool-dealing firms of the country, reported in 1893 that American purchases of foreign wool were limited to wools which would "not average to shrink more than 50 to 53 per cent."² Furthermore, the Tariff Board found in 1911 that the duty of 11 cents per pound of grease wool, as levied by the Payne-Aldrich tariff, worked out as a duty of merely 18 cents per pound of clean wool upon the raw material actually imported, instead of the duty of 33 cents per pound (three times the rate on the greasy wool) contemplated by that tariff law.³

After such considerations, we are not surprised to read that the "formula" does not mean "that four pounds of unwashed wool necessarily enter into every pound of cloth. It means that in a pound of the best cloth four pounds of certain clips of wool . . . abundantly accessible to foreign manufacturers but not accessible to our own except by the payment of the duty thereon, are necessarily consumed."⁴ But then one naturally asks: what of the cloths that are not of the "best" quality? what of the other "clips of wool"? what of the large domestic clip and of the low-shrinkage foreign fleeces? what of the cotton and the shoddy that so largely supplement or displace new wool? To the thoroughgoing protectionist these were not essential considerations. Senator Aldrich once put the protectionist case in

¹ To some extent a premium would counterbalance the gain in lower shrinkage. However, only the American buyers were particularly interested in this variety of fleece; and apparently their purchases did not bring into effect a premium that fully countervailed the gain they would secure at the customs.

² *Bulletin*, 1893, p. 258; an excerpt from the Report of the Aldrich Committee on Prices and Wages.

³ *Report on Schedule K*, p. 382.

⁴ *Bulletin*, 1909, p. 39; a reprint of a speech by Senator Aldrich.

this fashion: "As it is the weakest link in the chain or the lowest point in the levee that determines efficiency, so we are bound to take the highest-shrinkage wools accessible to foreigners and to calculate the compensatory duty on the basis of these." And with regard to cotton and shoddy: "We must arrange the compensation on the basis of the best cloths; otherwise, we should determine, by our legislation, that the manufacture of this country shall be confined to the lower grades of goods."¹

It should be stated in fairness to the architects of the four-to-one ratio that at the time this ratio was set up there was some justification for it. Among the important groups of foreign wools employed in the American manufacture were the so-called mestizo wools from South America and somewhat similar staple from the Cape of Good Hope. These were heavy-shrinking, fine merino wools;² and even a critic of the compensatory duties suggests that in so far as cloths were made of such material, "that assumption (of a four-to-one ratio) was not very far astray."³ But soon after the adoption of this formula and its embodiment into law came the introduction of worsted coatings. These fabrics, of which much will be said shortly, competed directly with the older cassimeres, broadcloths, and the like, and came to fill a very large part of the domestic demand for men's-wear goods. Yet these cloths were manufactured generally from wools which shrank less in scouring, and were made by processes which wasted less of the wool fiber. This group of goods, then, secured a specially favorable position with respect to possible foreign competition. The difficulties in its manufacture were over-compensated.

However, even in later years, evidence of reputable American

¹ *Bulletin*, 1909, p. 65; a reprint of a speech by Senator Aldrich.

Domestic wool clips have been estimated for recent years to shrink on the average between 50 and 60 per cent. These wools, it may be noted, include whole fleeces, whereas in the case of many foreign wools, especially the Australian, estimates of shrinkage pertain usually to skirted fleeces.

² Fine Buenos Ayres wool was reported to waste 60 to 70 per cent in washing and burring (*DeBow's Review*, 1854, xvi, 468).

³ Mr. Edward Moir, President of the Carded Wool Association, in *Tariff Hearings*, 1921, p. 2726.

mill-owners at various times leaves no doubt that the shrinkage and wastage in weight of wool assumed by the tariff ratio have not been and probably are not now unknown in the domestic industry.¹ Just how frequently cases of such large shrinkage occur in the American manufacture, and how great they bulk therein, cannot be ascertained with accuracy. Probably they form an inconsiderable part of the total output, most likely less than 10 per cent of total yardage. Yet it is to cover this group of cases that the tariff theory is directed. If one accepts the principle of full protection to the American wool manufacture, acceptance of the four-to-one ratio follows. Indeed, perhaps a higher ratio would sometimes be justified. Moreover, in employing an extreme ratio of this sort, the legislator would not necessarily be encouraging, at least directly, the establishment or expansion of sections in the wool manufacture of specially low comparative strength. Some portions of the industry using high-shrinkage wools would undoubtedly be as effective as other portions employing staple of lower shrinkage.

It is not necessary for our purposes to inquire further into this "principle of the maximum," as I like to call it. I have given a sufficient exposition of the protectionist's views. The conclusion is obvious that for many fabrics, indeed, for most fabrics, the law has given a considerable hidden, incidental protection to their domestic manufacture. In covering adequately the most disadvantageous conditions, the tariff overshot the necessities in all other cases. And the proponents of compensatory duties have not always been obdurate in denying this fact. The committee of manufacturers who in 1866 outlined a scheme of protective duties — the model of the Wool and Woolens act of 1867 — in which they proposed to place the cotton-warp worsted fabrics of the period under the same duties as all-wool woolen goods, frankly admitted that only two pounds of wool were re-

¹ Data have been presented at various tariff hearings upon this point. Those for two recent tariff revisions, 1897 and 1909, are reproduced in *Bulletin*, 1897, pp. 93-95; and 1909, pp. 49-53. For instance, on the latter occasion, M. T. Stevens & Sons Company, of North Andover, Massachusetts, gave three examples in which from 3.34 to 4.03 pounds of greasy wool were required to produce one pound of finished cloth.

quired for the one class of goods, whereas four pounds were needed for the other. "A portion of the specific duties on worsteds will, therefore, be protective to the manufacture (of that article)," the committee added.¹ Also, when the country was threatened with a change to a free-wool basis, — a basis which of course would remove the possibility of all compensatory duties, — the concession was made that such rates "contain an element of safety." This was said to be particularly true on the cheaper grades of goods. "It is the pound duty, and not the low ad valorem duty collected upon low values, which insures the domestic market to this class of goods."² And the petition to Congress of the National Association of Wool Manufacturers acknowledged that "the present specific duties, while compensatory for the wool duty, contain also a measure of protection upon various lines of goods."³ Finally, if further evidence were necessary, one might find it in the report of the Tariff Board on Schedule K, rendered in 1911: "The compensatory duty is now fixed at a point intended to be adequate to compensate the manufacturer using nothing but foreign wool of 66 $\frac{2}{3}$ per cent shrinkage. Practically no wool of such heavy shrinkage is imported under the present tariff rates. Consequently the specific duty is more than compensatory for manufacturers using wools of lighter shrinkage." And this condition holds true "to a much greater extent in the case of fabrics made partly or wholly of shoddy, wool waste, and cotton."⁴

¹ *Statement of the Executive Committee of the National Association of Wool Manufacturers to the United States Revenue Commission*, 1866, p. 20. This action was defended on the ground of the worsted manufacture's youth. One should add that this action was not taken by the drafters of the Wool and Woolens act, a separate paragraph and set of duties being provided for dress-goods, the only worsted fabric produced at that time.

² *Bulletin*, 1893, p. 288.

³ *Bulletin*, 1894, p. 33. See also *Bulletin*, 1894, p. 10; and *Bulletin*, 1909, p. 106: a Boston merchant is arguing against free wool and the elimination of the weight duties, and urges manufacturers to "take into account what they would lose" in the abolition of the compensatory rates.

⁴ *Report on Schedule K*, p. 13.

Some of the discrepancies between actual fact and the four-to-one theory may be seen in a tabulation published in the *Textile World Record*, January, 1909, xxxvi, 448-449, shown on the following page.

The action of the compensatory duties might have been made less severe if somewhat greater allowance had been made for the variation in qualities of wool products. Products of low value are manufactured, by and large, from wools of low grade or from mixtures of wool with cotton or shoddy. In either case the compensation required would be below the four-to-one ratio. In the case of admixtures of cotton or shoddy, the reason for less compensation is obvious. In the case of lower-quality fiber, the differentiation would flow from the relationship between shrinkage and quality of wool. The more costly wools, such as merino, contain for the most part a higher proportion of wool grease, suint, and dirt than do the less valuable fleeces, such as crossbreds. While a fine merino will shrink 50 to 75 per cent in scouring, a quarter-blood will lose around 25 to 35 per cent. And a crossbred staple will normally make a less expensive fabric than merino. Accordingly, a progressive rate of compensation upon the basis of value-group among wool products would have given a more equitable system of duties, — at least, a system which would burden the various qualities of products with more equal rates in ad valorem terms.

While no thoroughgoing recognition was given this method in actual practice, yet some concessions were made from time to time to such considerations. Even the rates in the act of 1867 were not arranged strictly on the four-to-one principle. The rates on dress-goods are a case in point. These fabrics, it will be recalled, were woven chiefly upon cotton warps during the sixties; and to make allowance for this circumstance, the compensatory duties were placed on a somewhat lower scale than a strict

Type of fabric	Weight per 10,000 yds. (lbs.)	Amt. of grease wool required (lbs.)	Amt. of shoddy used (lbs.)
Worsted serge: 18.4 oz. per yd.	11,500	21,941	....
Cotton-warp dress-goods: 6.7 oz.	4187	4515	....
Worsted dress-goods: 6.7 oz.	4187	9760	....
Worsted serge: 14.5 oz.	9062	20,945	....
Cotton worsted: 14 oz.	8750	3125	....
Piece-dyed kersey: 25 oz.	15,625	32,426	13,167
Cotton-warp beaver: 28 oz.	17,500	6023	22,123
Irish frieze: 34 oz.	21,250	23,625	17,719
Wool cassimere: 13 oz.	8125	32,143	....
Wool dress-goods: 6 oz.	3750	14,823	....

adherence to the accepted formula would have dictated.¹ Again, for yarns, blankets, and flannels, a gradation of compensatory duties was set up, a gradation which varied with the value of the article. Furthermore, with each successive tariff law, some new refinement of this sort was introduced, such as the separation of tops from the other wool products or an addition to the number of value-classes for a given manufacture. Thus, cloths in the acts of 1897 and 1909 were granted a compensatory rate varying in accordance with whether the fabric was worth less or more than 40 cents per pound. As early as 1883, the blanket paragraph had acquired five divisions of the compensatory rate; and four were retained in the act of 1922. And the dress-goods section had by the time of the Dingley act taken on a complexity hardly equaled in the entire tariff, outside of paragraphs based entirely upon the specific form of duty.²

For the most part, however, such changes as these cannot be taken as essential modifications of the original ratio. The reductions in compensatory rate for goods of lesser values were generally too slight to have any considerable effect on trade movements. We may judge the revised system by its results;

¹ The duty was levied (and incidentally has since then usually been levied) on a square-yard basis: 6 cents per square yard if valued at not more than 20 cents per square yard; and 8 cents if valued higher. (Such goods must not weigh more than 4 ounces per square yard. Should they do so, they were deemed of the nature of "cloths" and dutied at the cloth rate, 50 cents per pound.) The two classes of dress-goods were set up, and the rates graded, seemingly, on the theory that the more expensive goods would contain either more wool or wool of a higher shrinkage. A 3-ounce fabric would receive a compensatory duty of 32 cents per pound if valued at not over 20 cents per square yard; and one of about 43 cents per pound if it fell in the higher class. In such rates, obviously, there was a large opportunity for incidental protection, if allowance be made for the weight of the cotton warp.

² In the dress-goods paragraphs, and indeed in others, the specific portion of the compound duty did not always vary with each value-class of product, but a difference in duty was secured by varying the ad valorem rate. Thus, in the cloth paragraph (which is simpler than the one covering dress-goods), goods were divided into three groups in the 1909 tariff act: at values of 40 cents, and at 70 cents; and the duties were progressed as follows:

Cloths valued at not over 40 cents per pound: 33 cents a pound plus 50 per cent ad valorem.

Cloths valued above 40 but not over 70 cents per pound: 44 cents plus 50 per cent.

Cloths valued above 70 cents per pound: 44 cents plus 55 per cent.

This feature will be noted further in a later connection.

and as a matter of experience, the cheaper forms of cloths, yarns, or flannels counted for little in the general importations of wool goods.¹ With respect to dress-goods the classifications seem to have been of more real significance, especially the division between all-wool and cotton-warp fabrics. Importations of dress-goods were more widely distributed among the several classifications than in the case of other goods, and there was usually less divergence among the ad valorem equivalents of the duties, compound in nature, actually collected. The relatively high ad valorem equivalents of duties charged upon lower valued goods of other paragraphs will appear when the operation of the combined compensatory and "protective" rates is considered below.

If the reductions of compensatory duties for goods of lower value were nugatory, the duties for similar purpose upon fabrics of the highest value groups remained in close proximity to the four-to-one ratio. When in 1867 the duty on Class I wool worked out at about $11\frac{1}{2}$ cents per pound, the compensatory duty was 50 cents a pound for cloths. After a space of over forty years, and when the duty on this class of wool was 11 cents a pound, the rate of compensation for all cloths valued over 40 cents per pound was 44 cents a pound, — still four times the duty on the raw wool. For certain higher categories of blankets and for dress-goods weighing over four ounces per square yard (which came to be treated similarly with cloths), the same compensatory duty was levied. This portion of the schedule resisted change.² Perhaps it was this obstinacy that gained for Schedule K

¹ As illustration, we may take the importation of cloths in the decade 1900-1909. The average annual importations of these fabrics by value-classes were as follows:

Cloths valued not over 40 cents per pound	35,000 lbs.
Cloths valued between 40 and 70 cents	407,000 "
Cloths valued over 70 cents	3,960,000 "

The ad valorem, "protective" rate levied upon wool manufactures generally — additional to the specific rate — was usually less upon goods of low than upon those of high value. At least it was never greater upon the former than upon the latter. Accordingly the effective bar in the way of lower-quality importations must have been the "compensatory" duties.

² The only real exception to this statement is the tariff of 1883. At that time, according to the protectionists, the "symmetry of the schedule was destroyed"

the appellation of "the backbone of protection." Some reasons for this rigidity will be found in later considerations of the industry's internal organization and the relation thereof to tariff-making.

The final step in this story relates to the tariff of 1922. At that time, in agreement with, if not in consequence of, the advice of both the Tariff Board (1909-1911) and of the later Tariff Commission, the duty on wool was no longer connected with the fiber in its greasy state, but was levied upon the clean content.¹ The rate was fixed at 31 cents per pound of clean content; and, incidentally, this rate may be viewed as another application of the principle of the maximum, applied to the raw-wool duty, to be sure, but indirectly affecting the wool manufacture. This rate was supposed to convey the same protection to wool on the clean basis as had been extended by the Payne-Aldrich tariff of 1909 by its duty of 11 cents a pound upon greasy wool. If so, wool shrinking 65 per cent must have been taken to secure the clean-wool rate embraced in the 1922 tariff; and this shrinkage is of course a high one. Moreover, in fixing upon this single clean-wool rate, Congress was flying in the face of the Tariff Commission's wise recommendations. Early — in its *Report on the Wool-Growing Industry* — it suggested that the duties, still on the clean basis, should be graduated in accordance with the quality of the wool, three steps for the three grades of fine, medium, and coarse wool being proposed. Thereby somewhat the same protection, in ad valorem terms, could have been bestowed on each grade of fiber. Later, in connection with the actual formulation of the tariff, it presented several alternatives for modifying or restricting the influence of the single rate, — among them, a limitation on the height to which the specific duty should rise in ad valorem terms. This last suggestion found favor with the House of Representatives, — namely, that the duty on clean wool given in terms of cents per pound should not (*Bulletin*, 1885, p. 221), and for this reason: the duty on grease wool was placed at 10 cents per pound, while the highest compensatory duty even on cloths was only 35 cents — merely three and one-half times the rate on wool.

¹ Tariff Board's *Report on Schedule K*, 1911, pp. 12, 392 ff.; Tariff Commission's *Report on the Wool-Growing Industry*, 1921, pp. 26, 27, 455 ff.

exceed forty-five per cent ad valorem, — but this proviso was dropped by the Senate.

To continue: with this new type of clean-wool duty, compensatory duties were perforce devised on a different basis. Now the wastages between the scoured wool to the partially or to the wholly manufactured articles must be employed to secure the proper relationship to the clean-wool duty.¹ For guidance in this matter, there existed the data brought out by the Tariff Board in its Report on the woolen schedule. Consistently with previous experience, however, the particular figures employed by the protectionist framers of the new law to arrive at proper compensatory duties were figures pertaining to the most disadvantageous conditions under which the manufacture might be operating. The Tariff Board found that the wastages of raw material in the several stages of worsted-cloth manufacture (taking into account the normal relative values of recoverable wastes) would average certain proportions: in the conversion of scoured wool to tops, around $7\frac{1}{2}$ per cent; of tops to yarns, $4\frac{1}{2}$ per cent; and of yarns to finished cloth, apparently around 12 per cent.² It pointed out, however, that there were cases in which these losses would run as high as 10, 8, and 20 per cent, respectively, — and Congress employed the latter figures! Typical is the case of conversion from yarn to cloth. The losses here are, of course, substantially greater in the manufacture of woolen than in that of worsted fabrics, since in the former branch finishing processes — napping, shearing, fulling, and the like — play so much more of a part, and involve so much more of a wastage. The following statement of the Tariff Board, then,

¹ Scoured wool is in effect, of course, the clean content actually realized. While the clean content is an estimate of the yield of usable fiber when the wool is still in the greasy condition, scoured wool is the fleece after it has actually gone through the cleansing process.

² *Report on Schedule K*, pp. 621-626. The Board gave no average for the conversion of yarns to cloth; but it does present the results in fifty-five cases of worsted fabrics and in forty cases of woolen goods. These show average losses of approximately 10 and 15 per cent, respectively. To secure a single rough figure as a general average for the industry, we may weight these two percentages according to the relative importance of worsted and woolen cloth production in the United States — and obtain a figure of approximately 12 per cent.

may be readily appreciated: "If it is desired to compensate the manufacturer of the *heaviest* shrinking woolen fabrics (italics mine) . . . the compensatory duty must be as much as 20 per cent of the compensatory duty on yarn higher than that duty. On the other hand, there are certain fabrics for which a fair compensatory duty would exceed the compensatory yarn duty by less than 5 per cent."¹ Yet it was the higher figure that Congress used, at least for the full and more important rate, — that for cloths valued above 80 cents per pound. Wool from the scoured condition could waste well over a third of its original weight before it is finally consolidated into the finished fabric, and the domestic user be amply compensated.² Again, it may be noted that the rate of 45 cents per pound upon cloths in the tariff of 1922 compares well with that of 44 cents a pound in the act of 1909. The change of method did not affect the result!

However, one provision in connection with the act of 1922 does mark a distinct step forward. As regards the cloths of the highest category, those valued at over 80 cents per pound, it is provided that the compensatory duty should be paid, not upon the full weight of the fabric, but "upon the wool content thereof." This decreases appreciably the amount of incidental, concealed protection that otherwise many producers of wool fabrics would still secure even under the new arrangement of tariff rates. In fact, with the new structure of wool and wool-fabric duties and with this latter limiting clause, Schedule K (or under the new tariff, Schedule II) has lost no inconsiderable portion of its extreme character. Concealed protection there still is, but in a modified form and to a less extent.

Around this system of compensatory duties as here outlined has waged a nearly continuous controversy, even within the ranks of the wool manufacturers, which began almost with its very inauguration. Mr. George W. Bond makes the statement that "the law of 1867 was imposed upon the wool manufacturers by the wool

¹ *Report on Schedule K*, p. 625.

² If the average wastage as reported by the Tariff Board had been used in fixing the compensatory duties, a total loss of 22.3 per cent from scoured wool to cloth would have been covered.

growers;"¹ and others have complained that this tariff was thrust upon the country by certain special groups. Thus, Mr. H. N. Slater of S. Slater & Sons Company asserted in 1878 that "at that time (1867) certain parties of great astuteness, representing the worsted and carpet interests, conceived a scheme by which great fortunes would be realized in those branches;" that the carded-wool manufacturers were beguiled into accepting the plan; and that the National Association of Wool Manufacturers, which had supported the general scheme of the tariff, "has been and is managed in the interest of the very small minority above alluded to."² And there is some evidence which bears out such contentions. Even Mr. John L. Hayes, secretary of the National Association, declared in 1883 that after the enactment of the 1867 tariff "nearly a half of the members of the National Association withdrew from that organization."³ But on the whole the discontent seems to have been centered largely in the manufacturers of high-quality fabrics. Such is the testimony of Mr. Hayes; and the leaders among the insurgents were men like Mr. Slater, a broadcloth manufacturer, and Mr. Edward Harris, an outstanding manufacturer of fine cassimeres.⁴

¹ *Report on Wool and Manufactures of Wool*, 1887, p. lx.

² *The Nation*, 1878, p. 183.

See also writings of Mr. Edward Harris, e. g., *The Tariff and How it Affects the Woolen Cloth Manufacture* (1871); *Memorial to the Ways and Means Committee* (1872); *Argument on the Foreign Wool Tariff before the Finance Committee of the Senate* (1871). In one place (*Memorial*, p. 22) he says: "This tariff (of 1867) was devised by carpet and blanket makers, who pretended to be 'The National Woollen Manufacturers' Association,' (sic) in combination with certain persons who raised fine bucks and wished to sell them at high prices, and who acted in the name of 'The National Wool-Growers' Association' . . . A greater farce was never witnessed." Mr. Harris writes always in a manner which would suggest some special irritation on his part. I give his views not as undeniably, but as an extreme statement of a position with which there seems to have been sympathy among an appreciable body of wool manufacturers of that period.

³ *Bulletin*, 1883, p. 9.

⁴ *Ibid.*, p. 9: The tariff of 1867 "gave great dissatisfaction to a very large class of fine cloth manufacturers. Mr. Nelson Slater, the most eminent broadcloth manufacturer in the country, Mr. Edward Harris, and the greater part of the Rhode Island manufacturers violently opposed the tariff." See also *Tariff Hearings*, 1889-1890, pp. 326-327.

In 1870, thirty-three corporations and twelve individuals, including "some of

The contentions arose from certain difficulties in the operation of the wool and compensatory duties already mentioned. These duties impeded the importation of those high-shrinkage wools which earlier had been largely used in the production of the finer fabrics. These wools, drawn from South America and British South Africa, had, according to Mr. Wright, previously been the most prominent rivals of the American clip. "Coming to market in poor condition and shrinking heavily, they had low values and (previously) entered under low rates of duty. Under the new classification (that of 1867), such wools had to pay the same rates of duty as others; while in actual effect the heavy weight duty made the charge on these wools much higher relatively than on those in better condition."¹ Indeed, the purpose of the wool-growers in framing the tariff of 1867 in its particular form seems to have been especially to exclude such fleeces.² If so, their efforts surely were successful. Mr. Slater asserted that "the importation of Cape and South American wools, formerly largely used, has been almost entirely suppressed, as the duty on them ranges from 60 to 90 per cent. . . . About nine-tenths of the clothing-wools imported for the American manufacture previous to the tariff of 1867 have been shut out by its operation."³ Even Secretary North of the National Association admitted that the protectionist tariff entailed to domestic wool-users "a restricted choice in their selection of material."⁴ Fine wool-cloth producers would find possible employment for those short-stapled, foreign wools of high shrinkage which, as noted above, formed an important group of material practically excluded by the specific duties and for the use of which a compensatory duty on a four-

the best manufacturers in the United States" (according to their own opinion) petitioned the Ways and Means Committee for as low a duty on fine wools as there was in the act of 1867 upon carpet wools. They contended among other things that the foreign market for high-shrinkage fine wools was particularly depressed because of the impracticability of purchase by Americans; and that thereby foreign manufacturers were enabled the easier to override the duties on wool cloths (*Bulletin*, 1870, pp. 81-82).

¹ Wright, p. 217.

² *Bulletin*, 1883, p. 96.

³ *The Nation*, 1878, p. 183. See also North, *Bulletin*, 1895, p. 42.

⁴ *Bulletin*, 1894, p. 10.

to-one basis was hardly adequate. Indeed, to equalize competition with fine worsteds produced from the lower-shrinkage wools, any single compensatory duty based on a relation to grease-wool duties would be inadequate. Such an arrangement inevitably meant a lower *ad valorem* or relative duty for wools of lower shrinkage. Nor should one in this connection neglect the successful competition of the new worsted "cloths" in the later decades. The relative decline in the woolen branch, even though it was in reality a world-wide phenomenon and only to a minor extent affected by the American tariff conditions, may well have caused the dissatisfaction with the tariff arrangements which became of particular intensity around 1890.¹

The outward evidences of the discord in these later years began perhaps with the agitation concerning the free-wool tariff bills, the Morrison and Mills bills, introduced into Congress in 1886 and 1888, respectively. The center of disaffection was said to be in Rhode Island. That area had figured in the earlier schism, and indeed one personage who took part in both actions was Mr. Rowland G. Hazard of Peacedale, a leading Rhode Island manufacturer of woolen goods. In the tariff hearings of 1889-1890, a petition signed by 530 men "engaged in manufacturing or dealing in wool and woolen goods" was presented asking for the removal of all duties on wool. Among the petitioners were various leading producers, notably, Mr. Hazard; Mr. Moses T. Stevens, described as "the largest individual woolen manufacturer in the United States;" the treasurer of the Middlesex Mills, Lowell; the Atlantic Mills, Olneyville, Rhode Island; and the Worumbo Manufacturing Company, of Lisbon Falls, Maine.² Since the National Association continued its policy of support to the pre-

¹ A critic of the compensatory system states: "Three years after the passage of the bill of 1867, it became apparent to manufacturers of fine cassimeres that under the bill these goods could not be successfully manufactured and sold at a profit, with the result that nearly all of the fine cassimere mills are now long out of existence" (Mr. Moir, *Tariff Hearings*, 1921, p. 2726). Undoubtedly, the fine cassimere manufacturers were the producers most affected by the new duties; but this is an overstatement of the case, especially in attributing so much effect to the tariff.

² *Tariff Hearings*, 1889-1890, pp. 164-166.

viously existing system, many manufacturing concerns including the Pacific Mills withdrew from that body.¹

This crisis passed, however, and the agitation decreased, especially after the experience of the industry under the Democratic tariff of 1894, — of which something will be said later. But the problem persisted. After two decades of smoldering, the flame broke out again in 1909. In that year the Carded Woolen Manufacturers Association was formed, composed chiefly of small-sized woolen mills. Its strength has never been great, the National Association now being able to maintain its ranks; but the new organization has kept up a steady agitation against the specific wool duty and the compensatory system of duties for wool manufacturers. Its indirect influence, if not that directly exerted by its members, has been a force to be reckoned with in subsequent tariff controversy.²

One further comment concerning the compensatory rates may be made: that the duties of this sort, being specific, have a tendency to vary in effectiveness. Provided general economic con-

¹ *Bulletin*, 1890, pp. 357-358; Report of the Secretary.

Even Mr. William Whitman was infected by the spirit. In 1897 he was writing to Mr. North: "You know very well that I have never favored such high rates of duty (on wool) as are proposed. . . . Our industry will be seriously handicapped by such high duties, and no compensatory duties will wholly compensate the manufacturer, no matter how large they may be" (*Bulletin*, 1909, p. 193). On the other hand, the *Bulletin*, as official spokesman for the National Association, stated in 1914 that free wool was not asked for by any manufacturers; and that it was not advocated by any persons who professed to speak for the manufacturers (*Bulletin*, 1914, p. 2). The latter seems, however, to have been an exceptional statement. The manufacturers have not infrequently shown a lukewarmness toward the wool duties.

² With respect to the charge that the National Association of Wool Manufacturers has been primarily an organization of worsted manufacturers for the purpose of furthering their own ends to the possible neglect of, or even at the expense of, the interests of woolen-cloth producers, the facts seem to show that there has been a half-truth in this assertion. Apparently, worsted manufacturers have been the strongest supporters and most active members of that organization; but it appears to be true also that at no time, save perhaps immediately after the tariff of 1867 was enacted, has the Association been without a considerable representation of important woolen men. According to an enumeration of 1919, the Association represented about a third of the woolen cards and woolen spindles of the country, and two-thirds to three-quarters of worsted machinery (*Bulletin*, 1919, p. 133).

ditions do not change, they tend to become steadily more onerous, even if maintained at a constant level. As Mr. Underwood put it, they "have an automatic tendency to increase toward the prohibitive points, entirely apart from the matter of design or manipulation. When producing or manufacturing processes improve and the cost of production grows less, the specific duty, remaining the same, becomes in effect more protective and more burdensome.¹ This action, of course, is slow in working itself out, but undoubtedly has been of some moment in the past. But the action of the general economic forces cannot be ignored. During the earlier part of the period since 1867, changes in general economic conditions went to intensify the operation of the special factor just noted. Prices of wool goods tended to fall with the general downward movement of prices from 1873 to the middle nineties;² and correspondingly the real weight of the (relatively constant) specific duties was enhanced. Of recent decades, however, the effect of the latter has been neutralized in an important degree by a counter movement of prices. As prices rose, the effectiveness of the specific duties obviously became less considerable. What the net result of the two factors, price change and improvement in methods of production, was in the years 1897-1914, cannot be estimated closely. Perhaps an estimate of a minor movement in either direction, of increasing or decreasing the effect of the duties, would not be far out of the way. In the period of the World War, the marked advance of prices, of course, diminished the force of the specific duties appreciably.

The discussion heretofore has been primarily concerned with the specific portion of the duties on wool manufactures. The ad valorem rates now demand attention; and here the general course is the most important feature. This course, unlike that in the compensatory rates, has been almost wholly and steadily upward. The duty on cloths fixed upon in 1867, it will be recalled, was 35 per cent, 25 per cent to be "net effective protec-

¹ 62nd Cong., 1st Sess., *House Report No. 45*, p. 13.

² See Aldrich, *Report on Wholesale Prices, Wages, and Transportation*, ii, 120-165.

tion" and 10 per cent to compensate the manufacturer for the internal revenue taxes. And the rate remained at 35 per cent, although almost immediately the internal taxes were eliminated.

Since that time nearly every tariff act has incorporated some advance in these protective rates, the most recent tariff, that of 1922, forming the only important exception to the general rule. The figure of 40 per cent appeared in the 1883 act, and that of 50 per cent in the McKinley tariff. The frequency of the 50 per cent rate was increased in the act passed in 1897, and the high-water mark of 55 per cent was reached, — a situation to be continued under the Payne-Aldrich act of 1909. When, after the interlude of the Underwood tariff, a return to the more avowedly protective system came to be made, a slight reaction had occurred: the 55 per cent figure had disappeared, and the rates on the less significant items were somewhat modified. Yet for the important cloths and dress-goods, 50 per cent was still the prevailing duty.

Such protective duties were the ones which gave character to the schedule on wool and wool manufactures. To be sure, the highest rates, including those of 50 and 55 per cent, were confined pretty much to cloths and dress-goods; but these fabrics formed the major part of importations, and in recent laws they were almost all made dutiable at one or the other of these highest rates. On the other hand, one should in fairness note the somewhat lower range of rates for less important fabrics. Tops paid similar rates as long as they came in under the "catch-all" paragraph of the schedule, that devoted to goods not specially provided for; but in the 1909 tariff they bore a duty of 30 per cent, and in that of 1922, one of 20 per cent. On the other hand, yarns, blankets, and flannels have never borne a higher rate than 40 per cent, except one classification of blankets under the tariffs of 1897 and 1909, and a few high-priced flannels under the tariff of 1890. To be sure, rates of 20 to 40 per cent on tops, blankets, and the like were sufficiently high to keep out most importations; and considering the lower ratio of labor cost to total conversion costs in the case of these products, probably such rates signified as great a measure of protection as did the absolutely

higher rates in the case of cloths and dress-goods. For example, the expense of converting grease wool to tops will not run over a few cents, as the chief value to a worsted top is given by the wool it contains. Accordingly, a duty levied upon its total value, even a duty of 20 or 30 per cent, would prove practically prohibitive in normal times.

Obviously, in the half century and more that has elapsed since the modern protective system was inaugurated, the domestic industry has been favored by a substantial and pretty steadily mounting barrier of avowedly protectionist duties. And, it should be noted, such rates quite well maintained even in the Democratic, "low tariff" act of 1894, — e. g., 40 and 50 per cent on cloths and dress-goods, — while, after 1913, when the prospect loomed of a substantial rift in the system, the abnormal conditions of the World War came to succor the industry. For no considerable time, then, has the industry been exposed to violent competition from abroad.

The two duties, specific and *ad valorem*, operating together, have led to a considerable increase in the average height of duties upon wool manufactures. Take the case of wool cloths. Under the tariff of 1867 (with the amending acts of 1872 and 1875), cloths paid average annual rates of duty (*ad valorem* equivalents of the compound duties) of 68.4 per cent, rates for individual years running from 60.4 to 73.4 per cent. Under the succeeding tariff, similar averages for the two classes of cloths, those valued at not over 80 cents per pound and those valued higher, reached 90 and 68 per cent, respectively. Under the Dingley and Payne-Aldrich tariffs, the annual averages ran as follows:¹

Cloths valued at not over 40 cents per pound	135 to 152 per cent
Cloths valued between 40 and 70 cents per pound . .	119 to 124 " "
Cloths valued over 70 cents per pound	92 to 96 " "

Under these later tariffs, to be sure, little importation took place in the categories other than that of highest value per pound; the

¹ Deductions based upon average annual figures of *ad valorem* equivalents are not satisfactory. Yet the difficulties in the way of getting adequate figures on a better basis are almost insurmountable, especially as one should employ wool and cloth of the same quality.

rates were practically prohibitive. But even with allowance for that consideration, there obviously had been a marked advance in effective rates. This situation, which obtained with at least equal force in the dress-goods division of the trade, is the more significant since on the whole there was no considerable enhancement of the ad valorem equivalents of the duties on the raw material, new wool. Always under the protective tariffs, from that of 1867 to that of 1909, the average annual figure of the ad valorem equivalent for raw wool duties has remained close to 50 per cent.

Not all the changes in effective rates are attributable, to be sure, to the purposeful increase of duties. For the period through the nineties, they may be laid in part to the "automatic" action of the specific rates above mentioned. Indeed, this factor seems of particular importance. The average value per pound or yard of cloths and dress-goods imported tended to decline in successive tariff periods through 1891-1894; and, in consequence, the ad valorem equivalents mounted more rapidly than the increase in the special ad valorem or protective rates. Subsequently, despite some addition to the duties, the actual rate tended to decline. These features are evident with respect to the item of cloths in the following tabulation, where the most important category of such goods, that of highest value per unit of quantity, is considered:¹

	Average annual value per lb. (dollars)	Nominal Specific (cents)	Duties Ad val. (p. c.)	Average ad valorem equivalent (p. c.)
1867-1875: all cloths	1.50	.50	35	65
1876-1883: all cloths	1.39	.50	35	71
1884-1891: cloths valued over 80 cents per pound	1.23	.35	40	69
1891-1894: cloths valued over 40 cents per pound . . . . .	.94	.44	50	97
1898-1909: cloths valued over 70 cents per pound	1.09	.44	55	95
1910-1914: same	1.15	.44	55	93

¹ This category of fabrics is nearly the only one which is fairly uniform throughout the periods under consideration, and at the same time is important. There is a decline in value per pound steady from 1867 to 1890: that is, a decline from \$1.60 to \$1.20 a pound, despite the change in classification in 1884. Under the McKinley

Not all the changes in the ad valorem equivalents of the nominal duties are to be attributed to the "automatic" action of the specific rates, as the changes in classification of cloths, particularly that in 1891-1895, have had an appreciable effect upon the unit valuation and so indirectly upon the ad valorem equivalent. Yet the force of this factor is evident in the above figures, as indeed it is also observable in the duties upon dress-goods.¹

Under these beneficial conditions respecting tariff rates, one might well expect the domestic industry to take over an increasing share of the domestic consumption. And, indeed, there were some marked changes in the course of importations, — a declining volume under the act of 1890 and a distinctly low level of importation after 1897.² However, the effect was not so great as the student noting tariff rates alone would anticipate. Especially in the period before 1890, imports kept up pretty well with the growth of population. Tariff history alone cannot explain the development of the American manufacture.

There remains yet to speak of two other matters connected with the tariff history of this industry: the frequently close relationship between the direct beneficiaries of the tariffs and the formulation of the several laws actually passed; and the experience of the industry under the Democratic tariffs of 1894 and 1913. Of the former, not much need be said, and nothing at all would be required were it not for the fact that the relationship just mentioned has been rather closer and more frequent here than in the case of many other industries. The lines of the 1867 tariff

tariff, unit price was approximately level, and again under the tariff of 1897. Under the Payne-Aldrich tariff, however, the value per pound began to increase, rising from \$1.07 in 1910 to \$1.20 in 1913.

¹ In regard to dress-goods weighing over four ounces per square yard, — which form another fairly homogeneous class, — the statistics of actual duties corresponding to those in the above table are:

	Av. value per sq. yd.	Av. duty ad valorem		Av. value per sq. yd.	Av. duty ad valorem
1867-1875	\$1.71	62.87 per cent	1891-1895	\$1.19	86.84 per cent
1876-1883	1.61	66.08 " "	1898-1909	1.00	99.12 " "
1884-1891	1.19	69.51 " "	1910-1914	1.04	97.55 " "

² See below, pp. 39 ff.

followed closely the recommendations made to the Revenue Commission in 1866 by a convention of wool-growers and wool-manufacturers which had been held at Syracuse, New York, in December, 1865. It was during these years, too, that the National Association of Wool Manufacturers was formed, and this organization immediately became the head and forefront of agitation concerning the tariff on wool goods. "The first object of the Association," said its leading spirit in the earlier years, "has been insurance against legislation hostile to the wool manufacture of the country;"¹ and surely the activities of the organization have conduced to that end. The first secretary, Mr. John L. Hayes, described by critics of the National Association as "a very talented and astute politician, from Washington,"² was unquestionably an able expositor of the Association's views and an assiduous worker. He was instrumental in founding the Bulletin of the Association, kept in close contact with Washington affairs, and watched zealously over the matters pertaining to the industry's interests. After his death in 1887, the secretaryship was soon taken over by Mr. S. N. D. North, another man of exceptional ability. Supporting these men has been a board of directors always embracing a number of the keenest business men in the wool manufacture. Since in the success of such an organization quality of the directing personnel is of peculiar importance, it is small wonder that the National Association has played an outstanding rôle in tariff affairs.

A knowledge of Washington circles began early to yield results. In 1872 Mr. Hayes prepared an article on the wools of the

¹ *Bulletin*, 1878, p. 233.

² Edward Harris, *Protective Duties*, p. 10: quoted in Taussig, *Tariff History*, p. 199. The phrase "from Washington" seems to have been a gratuity to emphasize Mr. Hayes's origin outside the wool industry. Mr. Harris charges that the Association had "spent considerable sums in various ways peculiar to Washington" (*The Tariff*, p. 17). While such action is not inconceivable in the morally loose period of the Grant administrations, I do not believe there is any basis for this accusation. Mr. Harris's writings, always somewhat extreme in style, are not infrequently erroneous in fact. However, the charge is a serious one, and, coming from a man so close to the situation, may have had some support from the actions of given individuals more or less identified with the National Association, although the latter would itself never have countenanced such proceedings.

United States "at the special request of the Department of Agriculture," which was sent out under the Department's authority. The author found occasion to advocate the continuance of the 1867 tariff on wool and woolens. Since at that time "the sentiment of the West in favor of that tariff was divided," the Association was assured that it "might congratulate itself that it had an opportunity through the immense circulation of the agricultural reports to make its views known to not less than a million of readers."¹ A decade later Mr. Hayes served as chairman of the Tariff Commission whose duty it was to gather data for the revision of the tariff made in 1883; and in the nineties we find Mr. North acting as secretary to the Ways and Means Committee during the preparation of the Dingley act. Such close contact with the affairs of the government must have given the Association a particularly adequate chance to present its side of the case. No breath of scandal, to be sure, has ever dimmed the honor of the organization;² it merely saw the value and learned the art of "lobbying" at an earlier period than many organizations, and was able to profit by its foresight. Probably it was able to secure better terms for the wool manufacture when

¹ *Bulletin*, 1872, p. 191, note.

² The most serious affair even indirectly connected with the National Association was that concerning the top duty in the act of 1897. At this time Mr. North was serving as secretary of the Committee on Ways and Means as well as of the Association; and Mr. William Whitman as President of the Association. (Mr. Whitman was a large operator in both wool and cotton-cloth production.) The latter surely mixed up his personal and quasi-public interests in a way which was quite unjustifiable. Thus, in a letter to Mr. North, he wrote: "You know how important it is not only to me but to the whole worsted industry of the United States, that such rates of duty should be imposed upon Tops as will enable them to be made here and not be imported from foreign countries" (*Bulletin*, 1909, p. 193); or when, in a letter to Mr. North, he urged: "I am unable to go to Washington and have no one to look out for my interests but yourself, and I depend on you. Of course, Messrs. Aldrich and Dingley will do all they can, but I am depending on you to let them know what I need. I depend on you. Dress-goods, yarns, and tops" (*Bulletin*, 1913, pp. 300-301). Dress-goods, yarns, and tops were the most important products of Mr. Whitman's mills. However, such activity as this reflects only indirectly upon the National Association. The case for high duties on tops was perhaps stronger than for wool products in general, — the relation of top importation to industrial organization in this country; and something of this point appears in Mr. Whitman's letters. The episode goes to show the impossibility of such a position as that of Mr. North at that time.

the tariff problem was being reconsidered from time to time than would otherwise have been the case.¹

In another and quite a different manner the better organization of the wool-manufacturing industry has been of service to that industry in tariff matters. The tariff of 1867, as already noted, was largely influenced by the recommendations prepared at the meeting of wool-growers and wool-manufacturers at Syracuse. The next important change in the tariff, that of 1883, was preceded by the investigations of the Tariff Commission, and there was no sufficient reason for a joint meeting like that of 1865. However, in 1888 we hear of an assembly of wool-growers, dealers, and manufacturers which drew up a tariff bill satisfactory to them all. The provisions of this bill have a strong resemblance to those ultimately incorporated in the McKinley act of 1890, although for the cloths of low values some reductions in rates were made, — that is, where moderate reductions would be of little consequence, but would serve well as window dressing. Of this tariff it was said that the Committee on Ways and Means accorded the industry "the highest rates asked in nearly every instance," and that "the increase in the duties on woolen goods (by that act) . . . was greater than in any other schedule."² Whether such a result flowed from the assembly held in 1888 is, of course, problematical. At least, pleas for assistance to the wool-growing and wool-manufacturing industries were strengthened by unison among the interests affected. Again, in 1897 a conference of the growers and manufacturers was brought about prior to the tariff revision. At this time the suggestion is said to have come directly from the Ways and Means Committee, which was "agreed as to the importance of some understanding between these two industries."³ And, again, the tariff as finally

¹ The files of the *Bulletin* contain many references to the accomplishments of the National Association with respect to tariff matters. A typical one is contained in the volume for 1886, p. 256. This is particularly interesting since, probably written by Mr. Hayes, it narrates among other exploits how the compound duties were "retrieved" after they were lost in the Tariff Commission of 1882,—of which body Mr. Hayes was chairman.

² *Bulletin*, 1890, p. 143; *ibid.*, 1892, p. 2.

³ *Bulletin*, 1897, p. 22.

constructed carried duties on wool manufactures a little higher than ever before. Finally, the act of 1909 was reported by the Association as "a good substantial fulfillment of the recommendations made to the Committee on Ways and Means on behalf of the National Association."¹

The account thus framed, of course, should not be taken out of its proper setting, — a Congress favorably disposed toward protection, and the efforts of many other industries to secure as adequate rates as possible for their products. There was nothing in the activity of the National Association any more culpable than that of other similar bodies or of unorganized manufacturers. One may even concur with certain students of politics in the view that the chief occupation of such bodies, lobbying, is not to be condemned at all — since its suppression might lead in some cases to activities of a truly undesirable character. The moral is simply this: the wool manufacture was better organized than most other industries, its efforts more skillfully directed, and, I believe, the results were somewhat in proportion. Without organization and without able leaders, who knows what it would have secured at the table where public favors were being distributed?

The experience of the wool manufacture under the Democratic tariffs of 1894 and 1913 is of special interest since in a measure it tends to validate some of the conclusions already stated with respect to the protective tariffs that have prevailed throughout almost the whole period since 1860. This experience might seem to the casual observer just the right sort to settle yet broader problems: how strong has the domestic manufacture become in recent years, and how well can it withstand direct foreign competition? Unfortunately, the situation in neither of the tariff periods mentioned was clear enough to answer inquiries such as these. In the first place, the competition with foreign producers of woolen goods was not direct. Import duties were lower than in the other tariffs of the post-Civil War decades, and unimpeded import of raw wool was allowed; but with rates upon

¹ *Bulletin*, 1909, p. 434.

wool manufactures running to 35 and 40 per cent, there obviously was nothing approaching free trade. The periods were merely times of moderate protection. Again, the duration of normal industrial activity under either of these tariffs was altogether too short for safe general conclusions as to the probable operations of the wool manufacture under tariff conditions even of such a character. Both periods had abnormal features. The earlier one was complicated by the depression which followed the crisis of 1893, and which was prolonged by uncertainties in government finance and by monetary problems. The later era, 1914 to 1922, was still more abnormal. The war, the postwar inflation, and the unusually severe crisis of 1920 all bestow an unnatural character on these years.

Yet there are notable aspects of both periods. One effect of permitting free importation of wool was to broaden the field from which American mills might secure their supplies of raw material. The prospective removal of the duty on wool in 1894 led Australian wool-dealers to expect "the attraction of American competition to the medium and inferior grades of Australian wool,—now excluded by the prohibitive duty,—and to greatly extend the classes, as well as the quantity, of wool used."¹ And such expectations are said to have been realized.² Likewise there was an increase in the importation from South Africa and the Argentine, where a large quantity of high-shrinkage, low-value wools was available.³ In a similar manner, the wool trade

¹ Annual review of Goldsbrough, Mort & Company, of Melbourne; quoted in *Bulletin*, 1893, p. 182.

² *American Wool and Cotton Reporter*, 1911, p. 994.

³ Importation of Class I wool by principal countries for the years 1891-1893 and 1895-1897 was as follows:

	Aver. 1891-1893 (in millions of lbs.)	Aver. 1895-1897 (in millions of lbs.)
Argentina	0.2	10.8
Australasia	10.7	16.8
Great Britain	25.5	66.5
British Africa	1.6	5.9
Uruguay	2.1	9.7
 Total	 40.1	 109.7

Much Australasian and South African wool came to us via London, and so appears as import from the United Kingdom.

during the period 1913-1922 extended to areas and types of staple which probably had been almost wholly neglected since the high wool duties had been reimposed in 1897. Statistics of importations tell the story in part. Thus South Africa, which in the years 1912-1914 sent only a negligible quantity of wool to this country, sent over 50 million pounds (Class I wool) in the year 1919. Argentine likewise shared in the enlarged trade. Our imports of clothing wool from that country rose from 25 million pounds in 1912-1914 to nearly 120 million in 1919.¹ Wools such as Cape merino and Australian off-orts, which had not been seen in the American market for fifteen years, now put in an appearance, and remained in attendance until the high rates of the Emergency Tariff of 1921 fell upon them.

The trade in wool manufactures in like measure showed the effect of changed conditions, especially the removal of the specific duties on such goods. It was at the time of the Wilson tariff, as has already been noted, that protectionists began to admit the "margin of safety" existent in the compensatory duties. The total volume of importations among wool manufactures measured in terms of value did not increase so greatly, as will be indicated elsewhere.² The value of the imports of manufactures, exclusive of carpets, knit-goods, and wearing apparel, rose by less than 10 per cent in 1895-1897 over the average of 1890-1893. The more considerable expansion came in volume; and this circumstance is tied up with the operation of the compensatory duties. While they remained in force, the introduction of cheaper goods was impeded and to some degree interdicted. When only an ad valorem rate remained, even though that rate, as in the act of 1894, was substantially the same as in the McKinley tariff, goods of lower quality could secure entry into the American market. The change in the character of imports is reflected in the reduced unit value of imports. In the years

¹ It should be taken into account that our total importations of Class I wool increased markedly between these years: from 88 million pounds in 1912-1914 to 334 million pounds in 1919. The noteworthy feature is that this increase came so largely in shipments from such countries as British Africa and the Argentine.

² See below, pp. 44-45.

1890-1894, the average value per pound of cloth imported was 93 cents, whereas in the years 1895-1897 this figure fell to 63 cents per pound. Similar values for yarns fell from 59 cents per pound to 49 cents per pound. Accordingly, the quantities of importations advanced markedly. The weight of cloths brought in increased by approximately 150 per cent, dress-goods by something like 25 per cent, and yarns by over 50 per cent.¹ The continuance of such high importations after domestic conditions had become adjusted to the new circumstances is somewhat problematical; but unquestionably the character of the goods brought in would have been considerably different from that of the goods imported over the compound duties of the protectionist tariffs.

The experience during the operation of the Underwood act does not show so clearly these phenomena relating to the compensatory duties. The almost immediate outbreak of the European War, the interruptions of normal commercial relations, and the rise of prices vitiate nearly all conclusions on lines similar to those above. The brief postwar period, from the armistice to the imposition of the Emergency Tariff, had equally peculiar features, making most comparisons with prewar conditions difficult and of doubtful validity. To be sure, in the first year of operation (1914), there was the same enhancement of the quantitative inflow of goods, running to considerable proportions, as had occurred in the early years under the Wilson act. The volume of cloth imports for that year increased in quantity by nearly 175 per cent, and that of yarns by some 1600 per cent, an extraordinary figure by reason of the very low importations under the previous law.² Average unit values also declined somewhat,

¹ Statistics regarding dress-goods are rather unsatisfactory since the unit of measurement for quantity is not uniform. In the years under the McKinley law, importations are reported both by square yards and by pounds,—according to whether they weighed less or more than four ounces per square yard; and in the years under the Wilson tariff, they were reported wholly by weight. The conversion of such data to a single basis must be at best approximate.

² Again, the statistics of dress-goods importations are not satisfactory; but as nearly as one can tell, the increase in importations was much smaller than generally through the schedule,—apparently only about 33½ per cent in 1914-1915 over 1910-1913.

though not in the measure that they did in the nineties.¹ After the first year or two, however, the volume of imports shrank rapidly, due chiefly to war conditions, and, except in the last confused year of this tariff period, did not again reach an unusual height.

Summary. The high and rising tariff on wool manufactures has been a distinctive feature of the decades since 1870, the conditions imposed by this sort of tariff being modified only by the brief periods of easy importation under the laws of 1894 and 1913, and by a slight reaction from the upward movement which came in 1922. The wool-manufacturing industry has been supported by a particularly generous protection, the form and height of which are both important.

The arrangement of compensatory duties resulted in a peculiarly artificial relationship between the American wool manufacture and the world's wool production. The domestic wool-user found it disadvantageous to employ certain foreign wools, those of high shrinkage; and in some measure, especially on the side of the woolen-cloth production, this condition seems to have proved a real hindrance to the activities of the American manufacturers. On the other hand, the premium on the use of light-shrinking wools played into the hands of the worsted industry.

The latter industry also was aided by the concealed protection which the compensatory duties supplied to all fabrics that wasted less in manufacture than the proportion allowed for in adjusting the rates. The woolen goods which incorporated shoddy, cotton, or light-shrinking wools shared in this special protection, but practically all the newly-risen worsted coatings were embraced in the favored group of fabrics. In less degree worsted dress-goods and other products enjoyed a similar sort of incidental protection.

The avowedly protective rates — the ad valorem part of the compound duties — were well maintained throughout the fifty years under consideration. Starting at 25 to 35 per cent, the

¹ The average value per pound of cloth had been \$1.09 in the years 1910-1913, and became 95 cents in the first years under the new tariff. Similarly for yarns the average annual value per pound fell from 97 cents to 68 cents.

really effective rates rose until they centered about 40 to 55 per cent. Even in the Democratic tariff of 1894, the level of these rates was not much affected. Nor did the Underwood tariff reduce these "protective" rates to a really low basis. Upon the principal articles of cloths and dress-goods, a duty of 35 per cent was still levied.

The combined effect of these several features could not fail to be noticeable in the American manufacture. A new era for the domestic industry had come. Safe behind high defenses, that industry was free to increase the volume of its production as the domestic market expanded. It could take on the manufacture of new types of fabrics, — worsted coatings, worsted yarns of the Continental system, woolen yarns of the Belgian system, and the like. It could introduce new and improved machinery, — and, unfortunately, it could also refrain from such introduction. On the other hand, however, one should note the rapidity with which production was extended, the direction which new types of output took, and the aims which improved machinery sought. These were all determined by factors other than the tariff; and the developments in such respects form the more important considerations with regard to the recent history of the industry. The tariff is of significance merely as a passive factor, coöperating with the growing effectiveness of the manufacture itself, in making possible the expansion and diversification of the industry that did take place.

With respect to this action of the tariff, one final comment may be added. The expansion and diversification have not led to independence. Various sections of the industry undoubtedly are more effective than they were a half century ago; but no considerable portions of the manufacture could as yet stand the full and direct competition of foreign industries. Free importation of woolen and worsted goods, even with untrammeled admission of raw wool, would mean reduction and severe reorganization of the domestic manufacture. Moreover, these recent decades have seen the introduction of new types of production, the manufacture of higher-quality fabrics. By reason of difficulties inherent in this character of production, the manufacture

of these newer fabrics probably is now as dependent upon the tariff as that of other types was in 1870.

The general situation with respect to the domestic wool manufacture is of particular interest from the viewpoint of commercial policy. It illustrates the necessity of choosing carefully the industries that shall be given the temporary protection envisioned in aid to "young industries," — unless, of course, any and all new ventures in domestic manufacture are to be regarded as advantageous to the country. Some industries respond more adequately than others to this limited form of protection. However, for the American wool-manufacturing industry, this is mere regret at best. The industry has been encouraged by a long series of protective laws, and it has grown to large dimensions. Future policy would seem to turn upon considerations of this vested interest and upon the value of a domestic wool manufacture as a feature of national defense. With such matters the historian is not directly concerned.

The special situation with regard to the newly added branches of the wool manufacture draws attention to a further feature of protective policy. It serves to illustrate a general principle relative to the assistance to young and budding manufactures where such manufactures involve more than one quality of production. The grade of production tends to be pushed up behind the sheltering wall, and always there is some section of the manufacture which is just struggling for existence. Protection once extended cannot readily be withdrawn until each and every quality of output has been effectively established within the particular country; and this may in the end mean the grant of aid to portions of an industry not well suited to domestic conditions. Only in rare cases, then, would there seem to be a possibility that protection to young industries could be taken away within a really brief period.

CHAPTER XXIII

IMPORTATIONS AND INTERNAL DEVELOPMENT

THE course of importations is in part the reflection of the conditions imposed by the tariff and so may well be considered immediately after a discussion of the latter. There are other forces, of course, — the strength or weakness of the domestic manufacture, the fluctuations of the general business situation, and the like; but when the tariff becomes as high as in the later decades, one would expect it to play a much larger rôle in affecting the trade movement than under a regime of low tariffs.

The larger aspects of the import movement are visible in the following tabulation, in which the average annual value of importations (duty paid) in the principal wool manufactures for the three years around and including the census years is compared with the total value of domestic production and importation.

PRODUCTION AND AVERAGE ANNUAL IMPORTATION OF CLOTHS,
DRESS-GOODS, BLANKETS, FLANNELS, AND YARNS
(*in thousands of dollars*)

Census Year	Value of Domestic Production	Importations (duty paid) (3-year Average around Census Year)	Total Domestic Production plus Importations)	Percentage of Imports to Total
1849	\$43,207	\$17,470	\$60,677	28.7
1859	65,596	33,544	99,140	33.8
1869	177,496 ¹	41,136	218,632	18.9
1879	194,157	37,610	231,766	13.7
1889	212,075	62,744	274,819	22.8
1899	229,572	19,947	249,519	7.9
1904	292,660	25,204	317,863	7.8
1909	392,976	27,970	420,946	6.6
1914	356,594	25,341	381,935	6.3
1919	985,296	19,308	1,004,604	1.9

¹ Since the value of domestic production in 1869 is inflated by the depreciation of the Greenbacks, whereas the value of importations was not, the ratio of imports to total consumption as presented above gives an erroneous picture; 25 per cent would be more nearly correct.

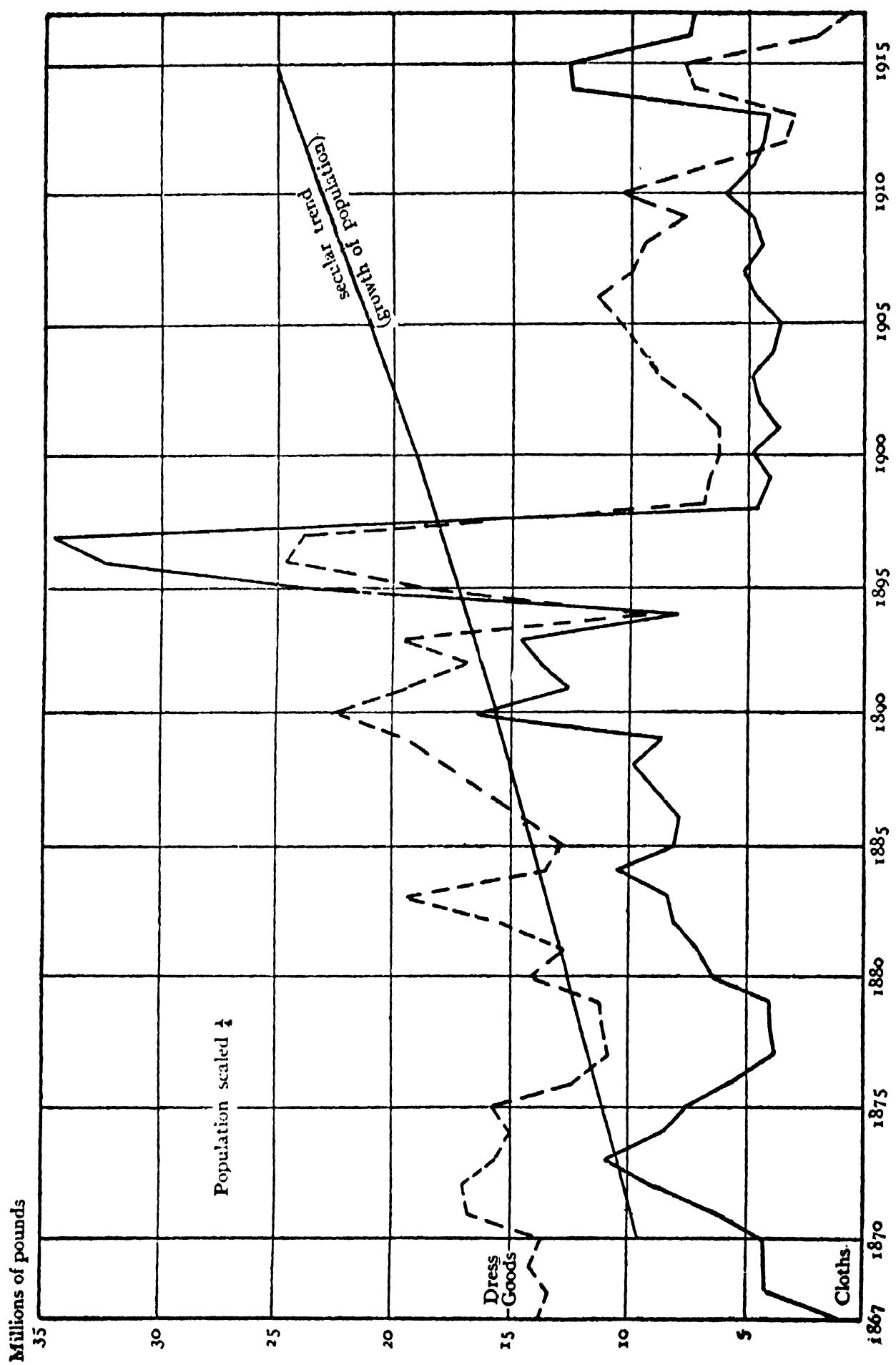


FIG. 12. Importation of Cloths and Dress-goods (in terms of quantity), 1867-1917.

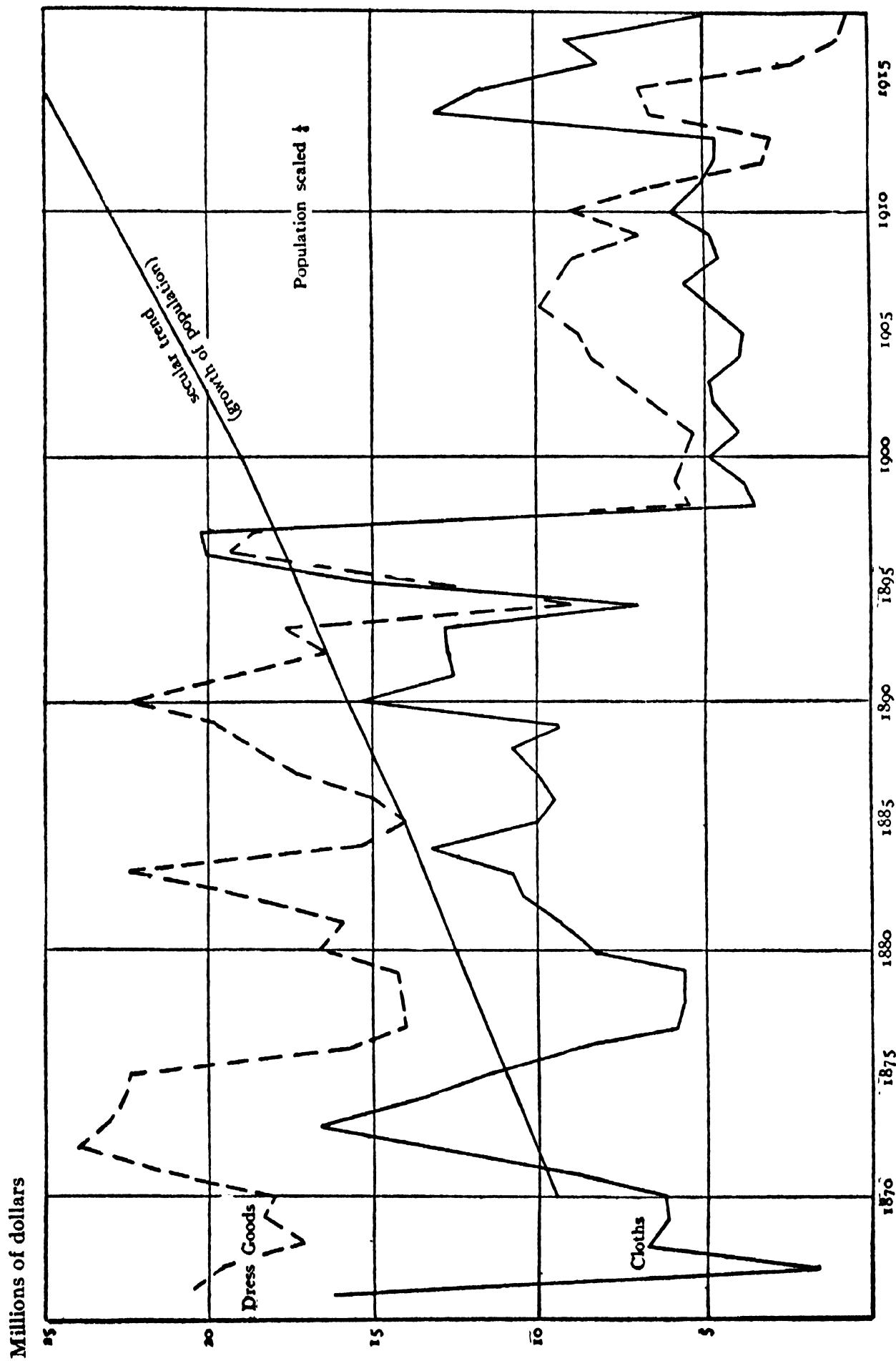


FIG. 13. Importation of Cloths and Dress-goods (in terms of value), 1866-1917.

The story is quite clear. The tariff and the domestic situation of the wool-manufacturing industry brought a new era in the matter of importations after the Civil War, and especially after 1870. As soon as the new conditions began to make themselves felt, i. e., primarily after the up-swing in general business to 1873, the proportion of imports to total American consumption ran a good third less than in the prewar period. And this situation persisted through the next two decades, — years covered by the tariffs of 1867 and 1883. Even the year 1890 should be included in this category, since the tariff of 1883, prevailing until October, 1890, dominated the figures given above for that year. Thereafter came the McKinley, Dingley, and Payne-Aldrich laws, giving an added boost to protection. Immediately the ratio of importations dropped, and reached a low level which in fact has obtained ever since.

A story of much the same purport is to be read from a closer examination of import statistics. Let us take the figures for the two primary categories of importations among wool manufactures, cloths and dress-goods. An inspection of either the quantity or value of such imports during the years since 1867 (Figures 12 and 13) shows that two distinct periods have obtained, — omitting for the moment the disordered interval introduced by the depression of 1894 and the operation of the Wilson act. In both periods, — that before and that subsequent to this disturbed interval, — the general movement of importation, whether of cloths or of dress-goods, and whether measured by quantity or by value, was not wholly unaffected by the secular trend, if we may call it such, indicated by the growth of population within the country. The correlation of these movements is perhaps more obvious in the years prior to 1893, but will be found to exist in both eras, though always somewhat confused by the oscillations between good and bad times of general business (note, for example, the up-swings to 1873, 1884, and 1890). The level of activity, however, is radically different in the two periods, especially when the continued growth of population is taken into account. The combined volume of cloth and dress-goods importations rose from less than 18 million pounds in the latter

sixties to almost 39 million pounds at the peak in 1890. On the other hand, the movement after 1897 rose from an ebb of approximately 10½ million pounds in 1899 to only 16 million pounds in 1910. The extreme heights of the tariffs passed in 1897 and 1909 set new limitations upon international competition in American markets, and these limitations, together with some improvement in domestic manufacture, kept importations on a decidedly low plane.¹

Reduction to a per capita basis of these import figures for cloths and dress-goods gives the picture yet more clearly. The data for quantity, of course, are preferable, since in them the effects of changes in general price levels are excluded. For the two classes of fabrics together, the movement expressed in terms of pounds per capita is as follows:²

1869-1871	0.52	1899-1901	0.14
1874-1876 . . . . .	.49	1904-1906 . . . . .	.17
1879-1881 . . . . .	.37	1909-1911 . . . . .	.145
1884-1886 . . . . .	.40	1914-1915 . . . . .	.20
1889-1891 . . . . .	.52	1920-1921 . . . . .	.07
1895-1896 . . . . .	.71		

In the decade of the seventies the volume of importations evidently did not keep pace with the enhancement of population; but by the beginning of the nineties the slack was taken up and the per capita figure was back to that of twenty years earlier. After the high point registered in the two years 1895-1896, the

¹ The movement of value in importations (Figure 13) is not so clearly related to the increase of population as that of quantity. However, one need merely bear in mind that the general course of prices between 1873 and 1896 was downward, and thereafter it turned upward again. Making allowance for this circumstance, one can see a similarity in the two movements.

² It should be noted that in the case of importation under the lower tariffs, the Wilson and Underwood acts, I have taken the years of heaviest inward movement, 1895-1896, 1914-1915, and 1920-1921. These figures are as unfavorable as could be secured.

The per capita import of cloths and dress-goods measured in terms of value are of interest:

1860	\$0.983	1895	\$0.438
1870 . . . . .	.634	1900 . . . . .	.142
1875 . . . . .	.767	1905 . . . . .	.151
1880 . . . . .	.501	1910 . . . . .	.166
1885 . . . . .	.429	1915 . . . . .	.186
1890 . . . . .	.607	1920 . . . . .	.167

new regime is reached. Here, as in the period 1870-1890, importation per capita again tends to move sideways though at a much lower level than previously.

Certain other features of the general import movement are likewise noteworthy. For example, the importation of many wool products has always been negligible during the period since 1867. Blankets and flannels have been imported in distinctly small quantities, a few thousand dollars' worth per year. The only exception to this generalization is the action of the item of flannels in the last years under the act of 1883. Then the imports of this fabric mounted temporarily to a level of some million and a quarter pounds. But even that importation formed, in terms of value, only about 5 per cent of total domestic consumption. Again, tops and yarns, important half-products of the wool manufacture, have played very minor rôles among wool goods coming in. The former was practically excluded until the Underwood act with its low duty of 8 per cent on tops came into operation. Yarns, as was the case with flannels, came in most heavily during the years under the 1883 tariff, averaging better than $3\frac{1}{2}$ million pounds per annum between 1886 and 1890. Yet as compared with the 68 million pounds which in 1889 were produced for sale in the American industry, this importation does not cut any considerable figure.¹ In short, cloth and dress-goods were not merely "the two primary categories" among importations of wool manufactures; they were practically the only types of product entered in any appreciable quantities.

A further point with regard to importations concerns the situation under the tariff of 1894. It will be noted (Figures 12

¹ It is impossible to determine what proportion of the wool yarns was woolen, worsted, or merino (cotton and wool mixed). A large ratio probably was worsted; and if so, the imports would form a larger percentage of total domestic consumption of that type of yarn than would total import compared with total domestic production of all sorts of wool yarns (see below).

In the years 1914 and 1915, it may be added, the importation of yarns bulked nearly as great as in these years under the act of 1883; but by that time the domestic production of wool yarns for sale had grown substantially from the figure of 1889 (specifically, to 123 million pounds). Accordingly, the importation would form a much smaller proportion of total domestic supplies.

and 13) that for 1895-1896 the increase in quantity of imports of cloths and dress-goods was substantially greater than the increase in value of such importations. Indeed, with respect to the latter, the combined value of the two categories in either year was scarcely more than for the earlier year 1890. The divergence in the case of quantities is explicable by reference to the lower unit value of such goods brought in at that time; and this change in turn flowed from the alteration made by the tariff of 1894 in the character of the duties on wool and wool manufactures. With the elimination of the so-called compensatory duties, fabrics of lower value could enter the American market, and the result was evident in the decreased unit value above mentioned. For example, cloths which had had an average value per pound of 96 cents in 1890-1892 now fell to a unit value of 65½ cents.

Finally, the contrast between action under the Wilson and under the Underwood tariffs should be pointed out. Although the ad valorem rate on cloths and dress-goods preserved in the latter act (35 per cent) was quite a bit lower than the similar rate in the Wilson law (50 per cent), the flood of importations even in the peaceful year of 1914 did not rise to the heights of the inward movement in the years 1895-1896.¹ The failure of

¹ The figure for importation during the calendar (rather than the fiscal) year is somewhat more unfavorable; e. g., in cloths, \$17,990,000 for the former as compared with \$10,735,000 for the latter. However, under a regime of substantially lower prices, the importation of cloths in both the fiscal years of 1895 and 1896 was valued at over \$20,000,000. (Data on quantity for the calendar year 1914 is not obtainable.)

On the other hand, the particularly low rates of duty upon tops and yarns induced a considerably increased importation of these goods. From a level of a few hundred pounds, imports of tops leaped in the calendar year 1914 to the volume of over 6 million pounds. Then came a lull during the war, but after an importation of around three-quarters of a million pounds in 1919 and 1920, nearly 15 million pounds were rushed in during 1921. Similarly, yarns showed an astonishing reaction after 1913. Importations had averaged 200,000 pounds in 1910-1913; but during the calendar year 1914 they reached 6,500,000 pounds. They subsequently went through much the same movements as did top imports.

Yet such figures of themselves mean little. One should take into account the relationship of these importations to total domestic consumption. The case of tops will serve as illustration. Even had the import of tops continued throughout the year 1914 at the rate which it maintained during the first six months thereof, the importations would have amounted to only 3.2 per cent of the quantity consumed

dress-goods to react upon the introduction of the lower rate is particularly noteworthy, although, to be sure, a longer period than actually occurred before the outbreak of war might have told a different story. Furthermore, we may note that the rise in quantity and in value was much more nearly the same in 1914-1915, whereas in the nineties the advance of the former had been so much greater than that of value. The question arises naturally: had the domestic manufacture advanced in efficiency since 1896, at least with regard to the production of the medium and low-grade fabrics, so that even under a lower tariff rate it was unprofitable for merchants to bring such goods in from abroad? Possibly some clues to the proper answer may be found in a later connection.¹

Sources of Importations.

That we may appreciate more fully the course of the competition which the domestic industry had to face from time to time, — and indeed often the source of inspiration for some of the changes in output of that industry, — we may turn from a consideration of the volume of importation to find whence these goods were coming. Some interesting facts appear. Confining ourselves to the three chief purveying countries, the United Kingdom, Germany, and France,² and to an examination of the value of the cloths, dress-goods, and wool yarns imported (see accompanying Figure 14), we may draw the following conclusions.

On the whole, the United Kingdom has maintained its position in a surprising degree. To be sure, in the seventies and eighties, France and Germany were cutting rather heavily into the trade in cloths; and similarly from the close of the Civil War until the middle nineties, the Continent was displaying an during that year in American mills. Even in relation to the volume of tops purchased by American mills, — the amount bought by them in an open market, — imports equaled but about 20 per cent.

¹ See below, pp. 172 ff.

² Other countries have contributed in no large measure to our import trade, except in recent years when Belgium sent around 8 per cent (in value) of our cloth purchases. The shipments of cloths from all nations other than those instanced ran less than 5 per cent until after 1900; and their contribution of dress-goods averaged less than $\frac{1}{2}$ per cent.

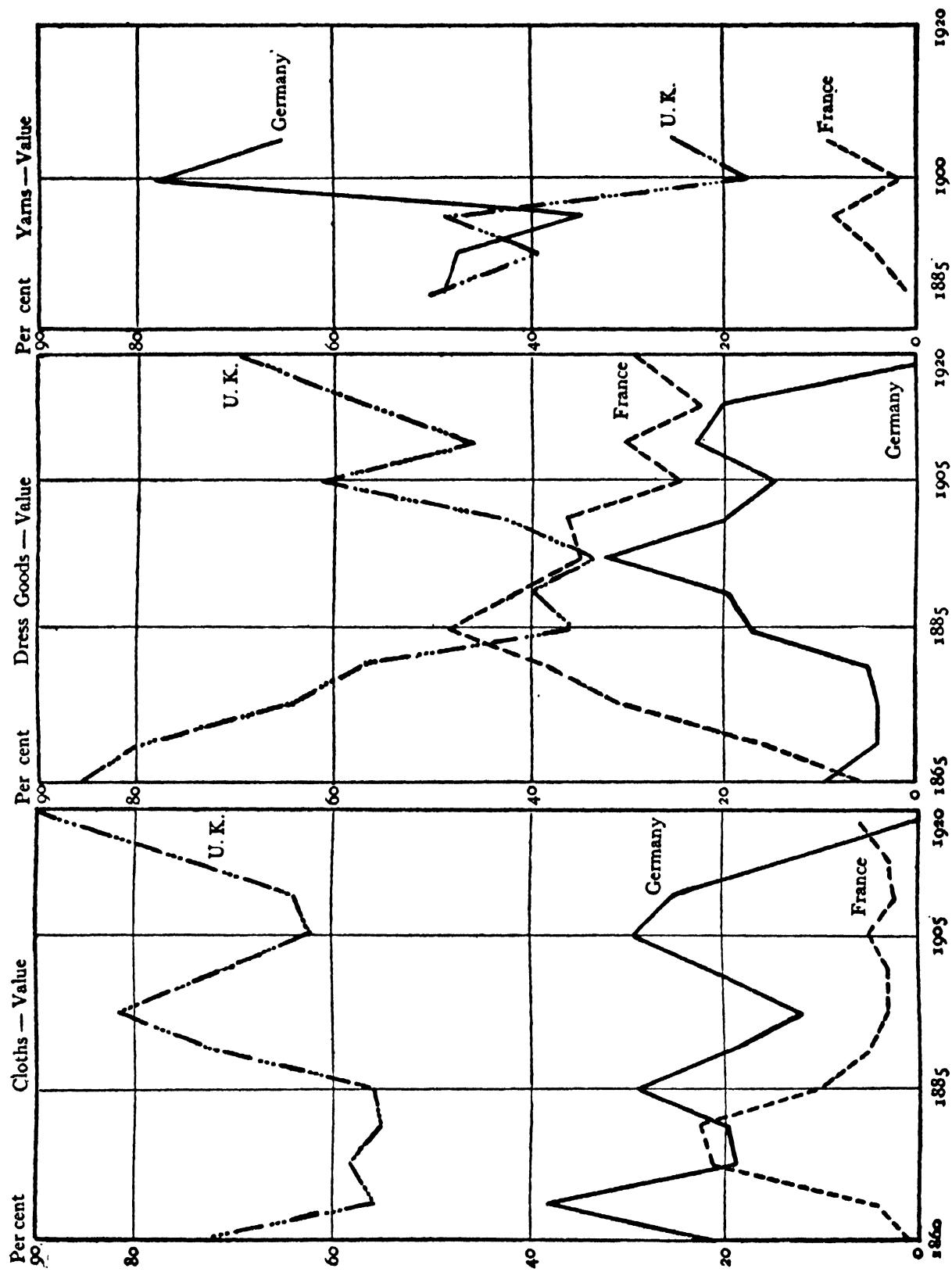


FIG. 14. Distribution of Import Trade (in terms of value) of Cloths, Dress-goods, and Yarns among the Principal European Exporting Countries, 1865-1920.

exceptional strength in the importation of dress-goods into this market. Both of these phenomena are to be explained, at least in large part, on the basis of quality in production of the foreign industries. The new type of cloth denominated "worsted coating," which provoked here and abroad the first effective rivalry ever experienced by the older woolen "cloth" manufacture, — the broadcloths, cassimeres, and the like, some of ancient lineage, — was originated in France, and early secured a wide production.¹ The British, with a hesitancy not unusual, were slow in taking up this novelty. The West of England manufacture was most obstinate, and the decline of that manufacture, already commenced, was accelerated by this inaction. Huddersfield, which had been wholly a woolen center, took up the new line but tardily, being spoken of by Bonwick in 1887 still as a "woollen neighborhood;"² and at about the same time the worsted coating trade of Bradford is given as one of the town's "most recent introductions."³ But perhaps equally important was the industrial and commercial expansion of the Continent under the influence of the free trade era which was initiated by the Cobden treaty of 1860, and of the industrial revolution in Germany, which became specially marked after the unification of the country. Then, too, another factor not without validity and significance was that given by the British themselves, namely, that, as regards all sorts of fabrics, the value of Continental goods shipped to the American market was higher per unit, and

¹ The honor as originator of worsted coatings is, to be sure, claimed by England. Tradition has it that the famous house of Clay in Huddersfield produced such a fabric for a London tailor as early as 1857. But American writers have usually given the credit, whatever little it is worth, to France, e. g., *Bulletin*, 1877, p. 111. At least, such fabrics became known to Americans through the exhibition of French coatings at the Paris Exposition of 1867: Hayes, *Bulletin*, 1884, p. 295.

² Bonwick, *Romance of the Wool Trade*, p. 429.

³ Cudworth, *Worstedopolis*, 1888, p. 70.

The classification of "worsted coatings" was not created for British export statistics until 1882, and not until the close of the eighties did the outward movement of such goods, e. g., to the United States, appreciably exceed the export of woolen coatings.

However, see a casual reference to worsted coatings in Bousfield, *Woolens at the Paris Exhibition of 1878*, p. 8; he describes them as "now so much used for men's wear."

therefore the American compound duties meant a lower ad valorem rate in actual fact.¹ Among European manufacturing areas, Yorkshire was at that time the "quantity" producer, the manufacturer of fabrics "for the million who must be supplied." As Baines put it in 1870, the "object sought" in a large part of the Yorkshire industry was "universality through cheapness."² And our import statistics tend to support this view of a difference in quality. For instance, as late as 1890-1892, the value per pound of cloth brought in from the United Kingdom, Germany, and France was \$0.93, \$1.11, and \$1.25 respectively.³ Likewise, the action of British imports during the periods of simple ad valorem duties — of which something will be said below — is confirmatory evidence on this point.

With respect to dress-goods importations, the effect of sluggishness in the British manufacture is more conspicuous than in the case of cloths. The Bradford producers were wedded to their lustre fabrics, made from the coarse-fibered English wools upon cotton warps. Even a British observer comments that "Bradford manufacturers and merchants, alike satisfied with developing mixed fabrics, . . . suffered the all-wool trade for dress-goods to drift into the hands of Continental makers. It is also too true that, for some time after the taste for all-wool fabrics had set in, Bradford manufacturers declined to believe that the once fashionable bright-haired stuffs had been ruthlessly thrown on one side; and even when it was evident that ladies would have none of them, they clung to the belief that fashion would veer around in their favor."⁴ Ultimately, the British producers were forced into the

¹ *British Documents*, 1886 [C. 4715], p. 126.

² Baines, *Yorkshire Past and Present*, p. 668.

³ Corresponding figures for dress-goods are of similar complexion: the average value per square yard imported from the United Kingdom was 18 cents in 1891-1892; from Germany, 23 cents; and from France, 22 cents.

⁴ Cudworth, *Worstedopolis*, p. 61. Apparently, too, the Bradford producers were not averse to propaganda. Although Mr. Cudworth does not trace it to these producers, he continues: At this time "there sprang up what is now historically known as the 'Bective Movement,' an endeavor, on the part of two or three ladies of undoubted position, to make their sisters of every grade of life purchase what they did not want. It was an unfortunate fiasco from the beginning to end." See also, *Bulletin*, 1881, p. 104.

newer line of manufacture, the all-wool trade; but that did not suffice for long. Though reconciled to all-wool fabrics, the British clung doggedly to their "home-grown" methods of production, the so-called Bradford system; and, indeed, the French or Continental system has today little representation in English mills. But, in the first decade of the new century, taste in women's goods veered strongly to the soft, drapy fabrics of the Continental type. Then, as largely the result of this fact, imports of British dress-goods, which had been rapidly increasing in value after about 1895, again declined, until in 1914 they amounted to slightly less than 45 per cent of the total.

Yet despite these lapses on the part of British manufacturers, on the whole they have done very well. In the importation of cloths, the British contribution has never fallen below 55 per cent of the total, and for the whole period from 1870 to the outbreak of the war it would run nearer 65 per cent. Particularly noteworthy is the advantage taken by the British of the low rate for cloths in the Wilson tariff. Whereas in 1890-1892 England's share had been approximately 74 per cent of the total (measured in terms of quantity), in 1895-1897 her ratio increased to 86 per cent. In the field of dress-goods imports, the United Kingdom has indeed not had so great success. Still, her share has usually been greater than that of any other nation, when yearly data are considered; and when the higher duties were imposed in 1897, her trade suffered proportionately less than that of the Continental countries, — at least until the shift in public demand put a premium on soft-feeling goods.¹ As to other products, e. g., tops and yarns, statistics are not available except for the twenty-year period 1885 to 1905, and during the greater part of this time the importation of such articles was subject to heavy duties. However, it is significant that during the low-tariff years of the Wilson act Great Britain sent us practically 50 per cent of all yarns imported; and that her shipments of both tops and yarns in the brief normal period under the Un-

¹ The introduction of the Continental system of worsted-yarn production into the United States may well have played an important rôle in this movement. Fostered under the tariffs of 1890 and 1897, it was able to exclude largely the importations from the Continent.

derwood law were, according to trade reports, the chief constituents in our trade therein at that time. In short, barring a few intervals when the introduction of new fabrics or the swing of public preferences told in favor of the Continental manufactures, the importation of British goods has been the factor of primary importance in our purchases from abroad. It is the competition with the British industry, then, that has still the most significance for the American investigator.

Types and Qualities among Importations.

Data with respect to the types and qualities of wool products imported into the United States are meager. Occasionally, indeed, one hears of some new article from foreign parts that is cutting a swath in the domestic market. Such was "Henrietta cloth, produced in Bradford (England) exclusively for consumption in the United States;"¹ and such was the hard-twisted and gassed worsted yarns of which "relatively much" was being brought in many years later.² However, most new products of foreign origin do not long remain exclusively of foreign manufacture. The American manufacturer soon imitates the imported article, and subsequent information concerning it relates wholly to the domestic production. And a similar situation exists with respect to certain broad classes of goods, e. g., worsted coatings and the soft French dress-goods. While their importation is new, mention is made of it; but afterwards nothing is said. The investigator can, to be sure, gather some further estimate of the variations in quality of imports by studying foreign industrial conditions and domestic import statistics; but at best this is a rough estimate. Wherefore, as a sort of last resort, we are driven to an examination of foreign export data, — of which in fact only the British are worth anything for this purpose, — supplementing such statistics when useful by figures from our own customs service.

Let us start with the category of cloths. In the years immediately following 1870, all-wool fabrics of this type predominated

¹ *Bulletin*, 1886, p. 315.

² *Tariff Hearings*, 1913, iv, p. 4270.

heavily over all others in the British exportations to the United States; but gradually "mixed" cloths, those containing cotton, — probably in the form of cotton warps, — began to overtake them. By the eighties mixed fabrics averaged twice the volume of the all-wool goods. Then came the McKinley, Dingley, and Payne-Aldrich tariffs with their heavy duties, and with compensatory rates that took little or no account of the admixture of substitute material in these mixed goods. The exportation of such fabrics was cut down heavily, as one would expect, and in the years under these laws the all-wool cloths appreciably surpassed the mixed. Only in the brief periods of the Wilson act and the Underwood law did the latter recover their position.¹

But meanwhile that new rival to both types of woolen cloth, worsted coatings, had made its appearance. Beginning with a low figure in 1882 — the first year when a separate classification was set up — such goods had risen by 1889 to overshadow the woolen exports: 11 million yards as compared with 3 million of all-wool and mixed woolen goods combined. In the succeeding decade, moreover, the yardage of worsted was nearly three times that of woolen cloth exported hitherward. But then occurred a strange thing. After the reduction of all wool-goods exportations to a new low level after 1897, worsted coatings tend to decline or to fail to rise proportionately in a general advance, as in that up-swing culminating in 1907; while woolen goods make rather steady upward progress. In the first decade of the new century, worsted coatings exported to the United States equaled roughly but two-thirds the yardage of woolen cloths sent out. In the year 1914 a total of 5.7 million yards of woolen goods was dispatched, — lumping broad and narrow cloths together, — but only 3.7 million yards of worsted fabrics. Our own import statistics tend to confirm this story. In 1916, when our serv-

¹ "Woolen, heavy, broad, all-wool" and "woolen, heavy, broad, mixed" were the chief groups of the two types among woolen exportations. The former had averaged 1.2 million yards in 1890-1893, and in 1895-1897 reached an average of 2.2 million. On the other hand, the mixed goods had been running .4 million yards, and in the later period averaged 4.8 million. Under the Underwood law, the imports of mixed fabrics did not increase so markedly. In 1914 they reached a yardage of 2.5 million, while those of all-wool goods attained 2.9 million yards.

ice first began to distinguish between woolen and worsted cloths, imports of the former composed 81 per cent of the total; and the ratio has steadily advanced.

Both by reason of the known action of the tariff and by reason of the peculiar course of the British exportations (Figure 15), the

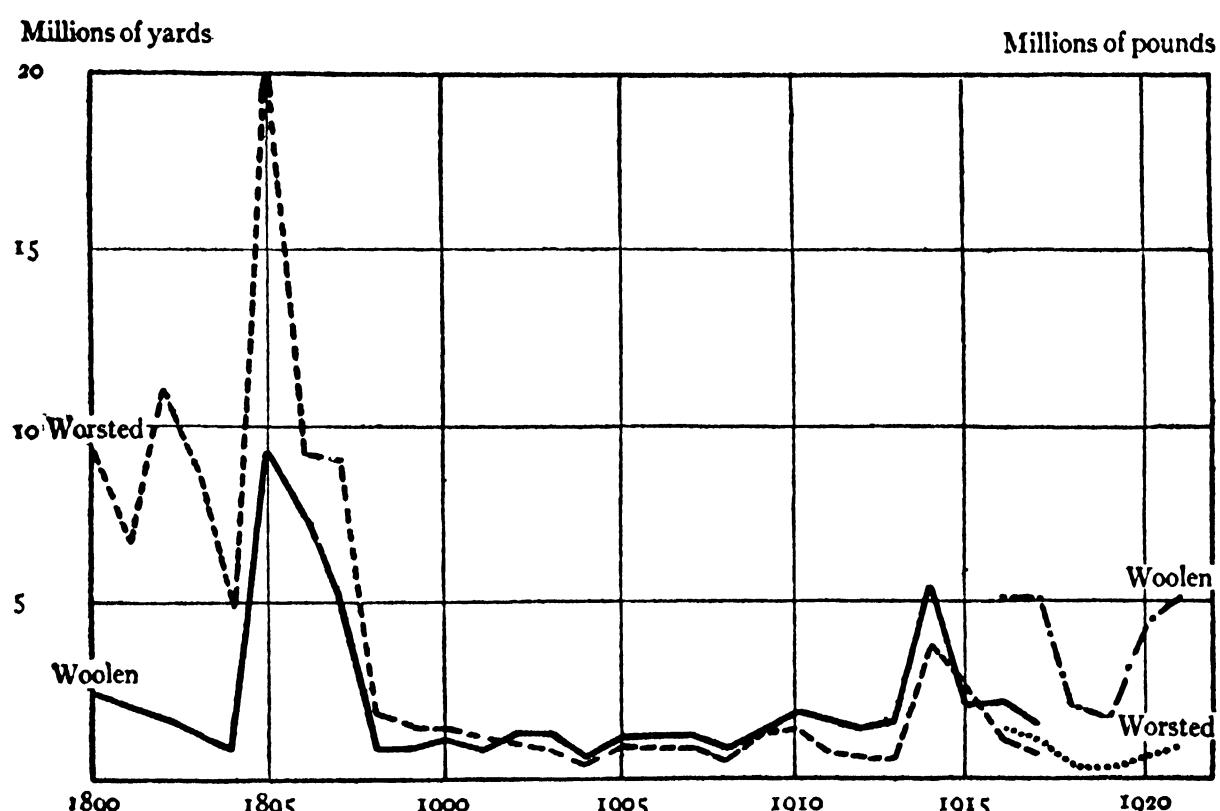


FIG. 15. Exportation of Woolen and Worsted Fabrics from the United Kingdom to the United States, 1890-1917, and total imports of such goods into the United States, 1916-1921 (both in terms of quantity).

decline in worsted exports to the United States is not to be explained on the basis of American tariff changes. It is notable that worsted exports held up less well throughout the years 1895-1897 than did woolen, that is, as compared with their previous records; that worsteds after 1898, now on a much lower level than earlier, continued to decline until 1904; and that the reaction in 1914 did not carry worsteds so high as woolens. The true explanation lies, I believe, in two circumstances: one, the increasing strength of the domestic worsted manufacture, especially after the trial and adversity of the low-tariff era; and second, in the latter years a drift in popular preference toward the older type of goods. Both of these matters will engage our attention later, and a full exposition need not delay us now.¹

¹ Possibly the shift during the years before 1910 in the proportion of cloths coming from the several foreign countries (see Figure 14, above) may have some re-

Let us pass to the matter of dress-goods. The account here is short. From the beginning of our period one type of dress-goods has made up 95 to 98 per cent of the total exportation from England, the "mixed" or cotton-warp worsted stuffs. To be sure, the quality of such goods has changed with the improvement in technique of production, but always the composition of cotton warp and worsted filling has remained. Woolen stuffs have never played any significant part in British exportations, and all-wool worsted stuffs have always played second fiddle to the cotton-warp goods. During recent decades, however, "all-worsted" goods have grown to greater importance in British exports. In Continental shipments such fabrics have always formed the predominant element, the French and Belgians particularly being noted for their delicate, light-weight dress-goods woven upon single merino warps. Finally, for the last few years we can secure some additional information from the newly reorganized American statistics on importations. Since 1916 imports of dress-goods have been reported with four subdivisions in classification. For the five years with regard to which data are available, 1916-1921, the proportions by these subdivisions have been as follows: bunting, 1.2 per cent; coat linings and Italian cloths (almost wholly cotton-warp goods), 39.5 per cent; cotton-warp dress-goods, 10.9 per cent; and all other, embracing chiefly the all-wool dress-goods, 48.4 per cent. The large ratio of coat linings is specially noteworthy. True, in these years the British influence was particularly strong; but the testimony of importing houses indicates that such fabrics have long been

lation to this matter of type of importation. I think not. Rather the shift in type of import reacted in favor of British importation.

Incidentally it may be mentioned that the recent American reports on imports for consumption differentiate worsted and woolen cloths into "plain woven" and "fancy woven." Statistics on these lines, however, are of little value to us. The American consuls, at least in the earlier years under this new classification, had no instructions as to how they should draw the line in making up their papers or passing on the invoices. A "fancy" weave, such as a hopsack or sateen, means little as regards quality of the fabric, and the differentiation of yarn-dyed or cross-dyed fabrics from the plain piece-dyed goods — a line employed by some consuls — means even less. The classification, in short, serves no useful purpose and means only a futile expenditure of energy all along the line.

an important factor in the trade. Indeed, prior to the introduction of all-cotton coat linings, such as Venetians, the proportion of this element in the total trade was probably much larger.

Finally, as to wool yarns: Here British export figures and the current American import statistics indicate the predominance of worsted yarns. Thus, in the decade of the eighties this variety formed approximately 90 per cent of the total British exportation of wool yarns.¹ However, there has been a tendency for the proportion of woolen yarns to increase in successive decades, and to gain upon the worsted article during the years of relatively low tariffs. In 1895-1897 they made up 13.1 per cent of the total; and in 1914-1917, 15.7 per cent. The predominance of worsted yarns — a predominance even in these later years — is traceable immediately to the greater differentiation in the American worsted manufacture, but ultimately to the greater homogeneity in worsted as compared with woolen yarns. This greater homogeneity not only encourages domestic differentiation but also facilitates an international commerce in such goods. The growth in the woolen-yarn trade bespeaks an increased standardization of this article, though this movement has been stimulated also by the enlargement of the domestic carpet and knit-goods industries.

Yet the further question remains as to the relative quality of these worsted coatings, dress-goods, and wool yarns, that were brought in during this period, — whether they generally were of low, medium, or fine grade. The answer happily is for the most part simple.

The tariffs of 1867 and 1883 apparently did not act so rigorously to exclude goods of medium and perhaps low quality as did the later laws. Though I have no doubt that the higher-quality

¹ American import figures, gathered under the classification set up by the Underwood tariff, indicate that something like a quarter of the "worsted" yarns brought in were "made of the hair of the Angora goat, alpaca, and other like animals." In the years 1914-1921 such yarns composed nearly 20 per cent of the total "wool" yarns imported. Mohair, alpaca, camel's-hair, and similar yarns are manufactured on the worsted principle. They are employed in the manufacture of coat linings, mohair suitings, mohair pluses, camel's-hair press-cloths, and sundry minor articles.

goods formed a large share of the imports then, one hears less in that period of high-grade fabrics among foreign imports, and the statistical data show that to some degree the lower types had a better chance. After the imposition of the McKinley act, however, the emphasis among observers is continuously (barring the brief low-tariff eras) upon the superior quality of our imports. An Austrian expert touring the United States reported the imports under the act of 1890 as largely "high-class fancy goods;"¹ and the National Association of Wool Manufacturers, perhaps with a little exaggeration, asserted our purchases from abroad to be "nearly all in the nature of luxuries."² And similar expressions have dotted the pages of textile periodicals and tariff-hearing transcripts in later years.³ During this regime of higher tariffs, only the better qualities of goods could scale the wall, especially the wall set up by the compensatory duties. For example, when in the various acts two or more classifications according to value were set up, with the compound duties only slightly lowered for goods of lower values, the great mass of importations came in at the top, under the highest value-classification.⁴ The case of yarns may be taken as illustrative. In the period 1873-1883, imports of yarns valued at over 80 cents per pound averaged 392,000 pounds, while imports under three lower minima averaged only 16,000 pounds. In the years 1892-1894, the full years under the McKinley tariff, imports of yarn worth over 40 cents a pound were eighteen times as great as importa-

¹ Mr. Latzko of Brünn, Austria, *Bulletin*, 1893, p. 349: Mr. Latzko appeared before the Ways and Means Committee.

² *Bulletin*, 1894, p. 35.

³ During the low tariff eras the importations of lower-grade goods had a very considerable increase. In the years 1896-1897, full years under the Wilson act, imports of yarns and of cloths were divided as follows:

Valued at:			
Yarns:	Less than 40 cents per pound	Over 40 cents per pound	
	488,000 pounds	1,502,000 pounds	
Cloths:	Less than 50 cents per pound	Over 50 cents per pound	
	13,415,000 pounds	20,043,000 pounds	

Data for the period under the Underwood act are not available in similar form; but the fact of an appreciable change in character of imports was well appreciated in the trade.

⁴ See above, pp. 15-16.

tions of less valuable material; and in 1910-1913, when the dividing line was at 30 cents per pound, imports of the more valuable goods averaged nearly seventeen times those of the less valuable.¹ It is also noteworthy that the average value per unit of quantity for these highest groups was usually much above the minimum posited for that class. Thus, under the act of 1890, all cloths valued above 40 cents per pound paid the same rate of duty; and yet the average annual valuation per pound of such fabrics as were imported varied between 89 cents and \$1.05. Similarly, in the Dingley law the highest class was composed of cloths valued over 70 cents a pound, and the average of actual importations in this group was close to \$1.10.² Obviously, limitation of imports to goods of high quality was a major result of the more extreme protective duties.

That the high duties levied upon wool fabrics have not entirely excluded foreign goods of this character from the American market is a noteworthy fact and one not wholly explicable upon the basis of differences in wages, prices, and the like. Competition in some goods, e. g., worsted yarns, has always been upon considerations of quality and price alone; and, it seems, competition in dress-goods has largely followed the same lines. With woolen and worsted "cloths," however, there has since the earliest times existed a prejudice in favor of foreign fabrics. It had its beginning at the time when American cloths of our best grade were in fact distinctly inferior to English goods, and it waxed strong during the many decades when the finest of British fabrics were superior to anything our mills could turn out; while in no small measure its vigor has subsequently been

¹ Again, in the matter of "cloth" importations, the average amounts under the classifications of the McKinley and Dingley tariffs were as follows:

Valued at:			
1892-1894	Less than 30 cents per pound	30 to 40 cents per pound	Over 40 cents per pound
	32,000	254,000	11,836,000
Valued at:			
1899-1909	Less than 40 cents per pound	40 to 70 cents per pound	Over 70 cents per pound
	36,000	454,000	3,879,000

² On the whole, it has seemed unwise to attempt a discussion of average unit values for the several products over the whole period. The trend in general prices, the effects of increased efficiency on prices, and the changes in character of "cloths," "dress-goods," and the like imported would make any conclusions hazardous.

maintained through the influence of our merchant tailors. The latter have been actuated in this matter largely by a natural affectation — the desire to appear to be handling fabrics which tradition has marked out as particularly elegant — although possibly the acquisitive instinct has also played a part: they could sell domestic goods at enhanced prices, if by the existence of a strong sentiment in favor of foreign cloths, these American fabrics could be represented to be the latter. In later years, to be sure, this prejudice has been weakening. A wider appreciation has come of the excellence of domestic production, arising in part from the high quality of ready-to-wear garments with respect to which the source of the constituent fabric has been less considerably emphasized. Not fearing to lose caste by the admission that he is carrying American as well as imported cloths, the merchant tailor is now striving less actively to keep alive the old belief. Perhaps we may look forward with confidence to the day when this sentimental element in the import trade will entirely have disappeared. For our immediate purpose, however, it is important to note that the prejudice in favor of foreign goods has undoubtedly prevented the tariff duties from being as effective as they otherwise would have been. Rates much higher than those actually imposed would not have excluded all wool cloths. And in so far as this factor continues to affect the merchant tailor and the ultimate consumer, it must be reckoned with in any prognostication of the future of our wool-cloth import movement.

Summary.

The import trade in wool products changed during the period after 1870 distinctly to favor the domestic manufacture. Absolute quantities and especially quantity per capita were decreased by the higher "protective" tariffs, and the years under more moderate laws were too few — especially normal years — to have much effect upon the development of the domestic industry. Moreover, with the heightening of the tariff has gone a restriction in the quality of fabric that could be imported. The larger portion of the field has been reserved for the American producer, and

happily that portion for which his operations were best fitted. Less happily, as we shall see, the domestic manufacturer has "edged up," attempting ever to turn out finer and yet finer qualities. Finally, the composition of our import trade, the experience of special articles, and the position of our chief competitors have changed from time to time. Such features, it may be remarked, have much significance in affecting the quality or composition of domestic production, the tendency toward differentiation, and the general competitive position of the domestic industry.

CHAPTER XXIV

CHANGES IN WOOL SUPPLY

THE features of the wool supply for the American manufacturing industry that are most directly connected with the growth in maturity of that industry are chiefly the expansion in breadth and intensity of demand by the worsted manufacture, with the corollary of an increased dependence by the woolen branch upon substitute material; the change in character of world wool production to favor the worsted industry; and the improvement in marketing conditions within the wool trade. These features are more or less interrelated and to some extent must be treated together; and then there are other, less important or less intimate factors which must be touched upon. But no attempt need be made here to trace the history of the wool production either in the United States or for the world as a whole.

The worsted manufacture in the United States, it will be recalled, was largely stimulated by the acquisition of wool under the Canadian reciprocity treaty of 1854-1865. The wools secured thereby were the long lustrous wools from the so-called English breeds of sheep. Such staple was the only type which was employable in the hand-combing operation or in the early machine combs; and it was not grown to any considerable extent in the United States. The free importation of wool across the northern border, combined with rising protective rates on wool manufactures during the early sixties, put the domestic worsted manufacturers in a particularly easy position; and the abrogation of the reciprocity agreement came as a distinct blow to them. Apparently the industry was seriously handicapped. Mr. Bigelow, writing at about this time, found "the principal hindrance to the further rapid extension of this (worsted) branch of manufacture" to lie in "the limited supply of raw material." "There is nothing," he said, "that would give such an impetus to the

manufacture of worsted fabrics in this country as a full supply of home-grown long combing wool.”¹

But the solution was not to come from that direction. In these very years technical improvement on the manufacturing side was making possible the utilization in the combing operation of wool much shorter in staple than the Lincoln or Leicester fleeces. Comb-builders increased the nicety in adjustment of the newer combing machines, especially of the Noble comb, until wools two and one-half to three inches in length could be employed. This change made available for the worsted manufacture not only the crossbred fleeces but also a goodly portion of merino staples.² The former, varying generally between four and six inches in length, were especially adapted to the improved manufacture, and formed the basis of subsequent growth in the American worsted industry. Especially, they were the chief material for the new class of wool fabrics, the worsted coatings, which were now coming to the fore and whose development was due in part directly to the technical advances in worsted machinery. Manufacturers of such goods used almost entirely wools of quarter and half-blood character. For example, Mr. C. H. Harding of Philadelphia, himself a worsted manufacturer, stated in the course of a tariff argument: “The manufacturers of fine worsted yarns do not ask for ‘free wool’ for the reason that we use largely the half-bred and quarter-bred merino fleeces of long, strong staple,” nowhere grown so well as “north of the Tennessee River and east of the Mississippi.”³

¹ *Bulletin*, 1869, p. 325.

² Incidentally, it may be mentioned that the classification set up in the tariff of 1867 reflects the situation in the wool manufacture of the time. Class I covered merino wools “or other wools of merino blood, immediate or remote”—i. e., any wools showing the merino strain, including all crossbreds; and these were denominated “clothing” wools. Class II embraced the “combing” wools, that is to say, “Leicester, Cotswold, Lincolnshire, Down combing wools, or other like combing wools of English blood”—together with the hair of the alpaca, goat, and the like. This classification, so soon departed from in commercial practice, was curiously enough preserved in the tariff laws—barring the free-wool eras—until the tariff act of 1922. Tariff nomenclature was not hastily changed!

³ *Bulletin*, 1884, p. 76. See also *Bulletin*, 1879, p. 283. Worsted coatings put a demand on American merinos. “The results of this new industry to the wool-grower are that the quarter-bred and half-bred wool from crosses of the mutton

The larger utilization of the pure merino wools in combing came later.

This alteration in the capacity of the combing machine amounted really to a revolution in the worsted manufacture. It gave an opportunity for expansion by broadening the field from which the industry could draw its materials, — an opportunity which, as will appear later, was readily grasped by the manufacturers. Largely as a result of this joint action, or better of one development reacting upon the other, medium-grade domestic wools regularly sold at higher levels than fine wools during the period 1878-1889, reversing the usual conditions.¹ Again, the importations of Class II wools, those of the English type, fell away from a high figure of approximately 50 million pounds attained in 1873, and in the decade of the eighties averaged less than 6 million pounds. While the tariff classifications remained the same — indeed persisted until 1922 — Class I or “clothing” wool was now no longer consumed exclusively in the woolen manufacture. “A very large proportion of the wool imported under this class (‘clothing’ wools),” said a writer as early as 1885, “is known to the trade as combing wool and is used as such.”² The revolution, too, had as important effects on the side of quality in manufacture. New fabrics came from the mills which had hitherto yielded only the bright, cotton-warp stuff-goods: not only the large category of men’s-wear fabrics embraced under the title of worsted coatings, but also the soft dress-goods for women’s wear, which now were as frequently all-wool as cotton-warp. This new production created a direct and powerful competition with the older woolen manufacture, — a competition which was a dominant feature of the period from 1870 to 1920. sheep with the merino used in these fabrics brings 25 per cent more than before their introduction.”

A writer on the Ohio wool-growing industry asserted in 1879 that “nearly three-fourths of the wool now being grown from these sheep (the American merino) is long and fine enough for combing purposes” (*Bulletin*, 1879, p. 70). However, I am inclined to doubt whether any considerable portion of it was at that time so employed. No lines of demarcation can be drawn, but the merino period comes, I believe, five or ten years later.

¹ Wright, p. 213.

² *Bulletin*, 1885, p. 248. Also, *Bulletin*, 1886, p. 208.

Let us return to the matter of wool production. In this period the character of the world's wool production, we may note, was entering upon a new phase, a phase which, like the technical developments in combing, tended to strengthen the position of the worsted manufacture. The immediate cause was an increased demand for mutton.¹ In the United States this movement had, in fact, begun in the decade or so just prior to the Civil War. It was accelerated during the war itself; and it continued to expand in the succeeding decades. Now the merino sheep had been the fascination of sheep-breeders in the earlier years and still remained so in a considerable measure. But the merino was not a mutton sheep, its carcass being small and of poor quality. On the other hand, the English breeds of sheep, while par excellence as a mutton producer, — a fact which "English mutton-chops" still attest, — yielded a fleece which did not have the adaptability or wide usefulness of other wools.² The combination of the desirable features in both animals, or at least a balancing to secure a fair representation of such features, was attained in the crossbred sheep, the mixture of the two breeds. The mating of a Leicester ram with a merino ewe was the first step, producing a "half-blood" animal with a carcass and a fleece partaking somewhat of both parents. Subsequent interbreeding yielded various intermediate strains which, measured in terms of the merino blood, were designated "three-eighths blood," "quarter-blood," and the like. As far as the fleece itself is concerned, the denomination follows the quality

¹ Wright (pp. 182-183) gives the advance of the worsted manufacture as one cause, although a secondary one, of the increase in mutton sheep. However, since in the earlier years of the worsted manufacture in this country the industrial demand was for the long wool from the English-breed sheep, the beginning of cross-breeding which came before the improvements in combing must be looked upon as at least flowing from other causes. Subsequently, the increased demand for cross-bred wool undoubtedly had some effect upon sheep-breeding, although still the demand for mutton, or, more specifically, for large lambs, continued to operate. I prefer to stress the reaction of wool-growing upon the wool manufacture.

² The so-called Down breeds of English sheep form an exception to the statement above made. These are good mutton sheep, and yet have a fleece which compares well with the medium-quality merino staple. The resemblance of the Down wools to the merino is indicated by the fact that they as "Down clothing wools" were included in Class I of the 1867 tariff.

of the fiber as compared with the full-blood merino fiber, rather than the amount of merino blood in the sheep from which it is clipped. Indeed, separate portions of a single fleece may be classified into two or more grades of wool. But all grades of wool below the full merino share in some degree in the characteristics of the English-breed fleeces. Primarily, since this is the fundamental basis of grading, such crossbred wool is of larger diameter than the merino. It is also of longer staple, on the average, and less wavy. By reason of the latter features, it is better fitted for the combing operation of the worsted manufacture. Moreover, for the type of combing machine used in the earlier days of the worsted industry, these elements, especially the greater length of staple, were of particular value.

Supplementing the desire to secure a sheep with a better carcass, the conditions of settlement in the chief wool-producing countries have tended to bring the crossbred animal into greater prominence. This sheep fits better in general farming than does the full merino, in part because only the rancher with a considerable flock can afford the expense of maintaining the purity of the merino stock, liable as it is to deterioration without expert care and the infusion at times of new blood. With the filling-up of our West, accordingly, the general character of the flocks has changed, and, indeed, is still changing, crossbred sheep replacing the fine-wooled merino. In the period following closely the Civil War, this phenomenon was particularly noticeable in the Middle West, which in recent decades had been the source of our largest wool supply.¹ This, again, tended to make available in greater measure the type of wool better suited to the worsted manufacture.

These two forces affecting the character of the American wool clip had their counterparts in foreign wool-producing countries. With respect to the former, the demand for mutton sheep, the influence reached such regions as Australasia and South America with the invention and gradual adoption of meat refrigeration. This innovation was first a factor in the early eighties; and since

¹ Wright, pp. 135-152, 245-250.

that time the frozen-meat trade from both areas has grown with exceeding rapidity. Subsequently, the other factor came into play. In states such as New South Wales and Argentina, the population has steadily increased, diversified and more intensive farming has tended to displace the grazing industry, and with these developments has gone the change in character of sheep. Accordingly, the world's wool supply has tended in the same direction as the American; and when in later years the American manufacture came to rely more heavily upon imported wool, it met a situation where the crossbred fiber was becoming steadily a more important constituent.

But as the years passed, the machinery of the worsted manufacture increased in precision, the demand on the part of domestic consumers rose in quality, and the conditions of the tariff made possible domestic production of higher-grade fabrics. As a result, the worsted manufacture began to seek a higher quality of raw material; and merino wool came into greater prominence in this branch of the wool manufacture. For example, in the middle eighties soft dress-goods of the type originally called Henrietta cloth came into fashion. For these, "soft and superfine merino combing wools" were said to be indispensable.¹ At about this time, too, "fine and medium-fine stock" was reported as a considerable factor in the worsted manufacture as a whole.² Among the earliest merino wools drafted for use in the worsted industry were the so-called delaine wools from the north central region of the country, — Ohio, western Pennsylvania, West Virginia, and that section; and these remain today among the best, if not clearly the best type of merino combing wool grown in the United States. The "territory" wools, which were increasing in prominence after 1870 with the advance of transportation facilities in the Far West, added another and a larger factor to the domestic supply. These wools, to be sure, have not proved to be so predominantly of the "staple" variety, — wools of sufficient length to permit combing. Yet, while containing a substantial element of clothing wools, those suitable only for the woolen branch,

¹ *Bulletin*, 1885, pp. 63-64; *ibid.*, 1886, p. 315.

² *Bulletin*, 1886, p. 208.

they have yielded a fairly large proportion suitable for manipulation in the worsted manufacture.¹

The introduction and spread of the French system of worsted spinning, of which more will be said later, brought a wider range of merino wools within the limits of demand of the worsted manufacture. Whereas the older Bradford system of worsted yarn production, using the Noble or other British combs, could not utilize wools less than two or two and a half inches in length, the French system employing the Heilman comb could take wools as low as an inch in staple. The latter system also could treat wools of weaker character, since the processes — combing, drawing, and spinning — put less strain upon the fibers. Moreover, by reason of the fact that the French worsted system aimed chiefly at the production of yarns suitable for the finer, soft, drapy fabrics of women's wear, the consumption of merino wools in this section of the manufacture bulked larger in its total of raw materials.²

The improvement in technique of the Bradford worsted process and the acquisition of the French worsted system both acted to create competition within the wool market for wools which had previously been regarded wholly as clothing wools; and each step forward of the worsted manufacture spelled increased competition for the older woolen branch of the industry. Typical of

¹ One should not imagine, as one might from the careless expressions of writers on wool, that there always have been and still are two distinct and separate classes of wools, that suitable for the woolen manufacture and called "clothing" wools, and that employable in the worsted industry and called "combing" wools. As a matter of fact, a considerable portion of the world's wool clip could be used for either purpose; there is a considerable overlapping of classes. The woolen manufacture can employ, as the Yorkshireman says, "any fiber that is long enough to have two ends," and from that minimum length almost any staple up to about five inches. The worsted manufacture demands a wool which is at least an inch in length, but can use anything longer than that, even the long hairs of the angora goat, alpaca, or camel. Accordingly, for wools between one and five inches in length, there is competition between the two industries. And this is particularly important with regard to merino wool, since hardly any of it runs over five inches in length. Such merino combing wool also forms a substantial proportion of the total clip.

² On competition of the French worsted process, see Warburg, *Wool and Wool Manufacture*, p. 11; *American Wool and Cotton Reporter*, 1909, p. 886; *Bulletin*, 1912, p. 390.

the rivalry is that recently brought to my attention by a practical woolen manufacturer. "Some fifteen years ago," he writes, "we were able to buy in the wool markets of this country what were called clothing wool sorts. . . . They were the sorts or throw-out of scouring mills and wool houses, adaptable for the fine spinning necessary in light-weight carded woolen fabrics. But such wools are no longer obtainable. As we see it, . . . the rapid introduction of the French spinning system in this country has absorbed and diverted them into worsted yarns, and we are more and more compelled to bid for wool in competition with the worsted comber."¹ Furthermore, since during the last forty years — barring a notable reaction in the most recent seasons — the worsted fabrics have found increasing favor with the buying public, the worsted manufacturer has been able to pay the commanding prices. He has dominated the market.²

In a sense the worsted manufacturer has been forced to dominate the market. To a much greater degree than the woolen manufacturer, he must employ new wool. He can use a certain proportion of cotton in the form of cotton warps, and he can mix cotton and wool fibers in the production of so-called worsted-merino yarns for the knit-goods trade. But he cannot employ wool wastes or shoddy for regular worsted fabrics. The staple of such materials is too short for service in the combing and spinning processes. Accordingly, to manufacture at all he must seek the wool market for large quantities of material.

Not only did public prejudices favor the worsted manufacturer, but tariff conditions as well. Something concerning this factor has already been said: the effect of specific duties upon the importation of high-shrinkage wools. The hindrance was felt most

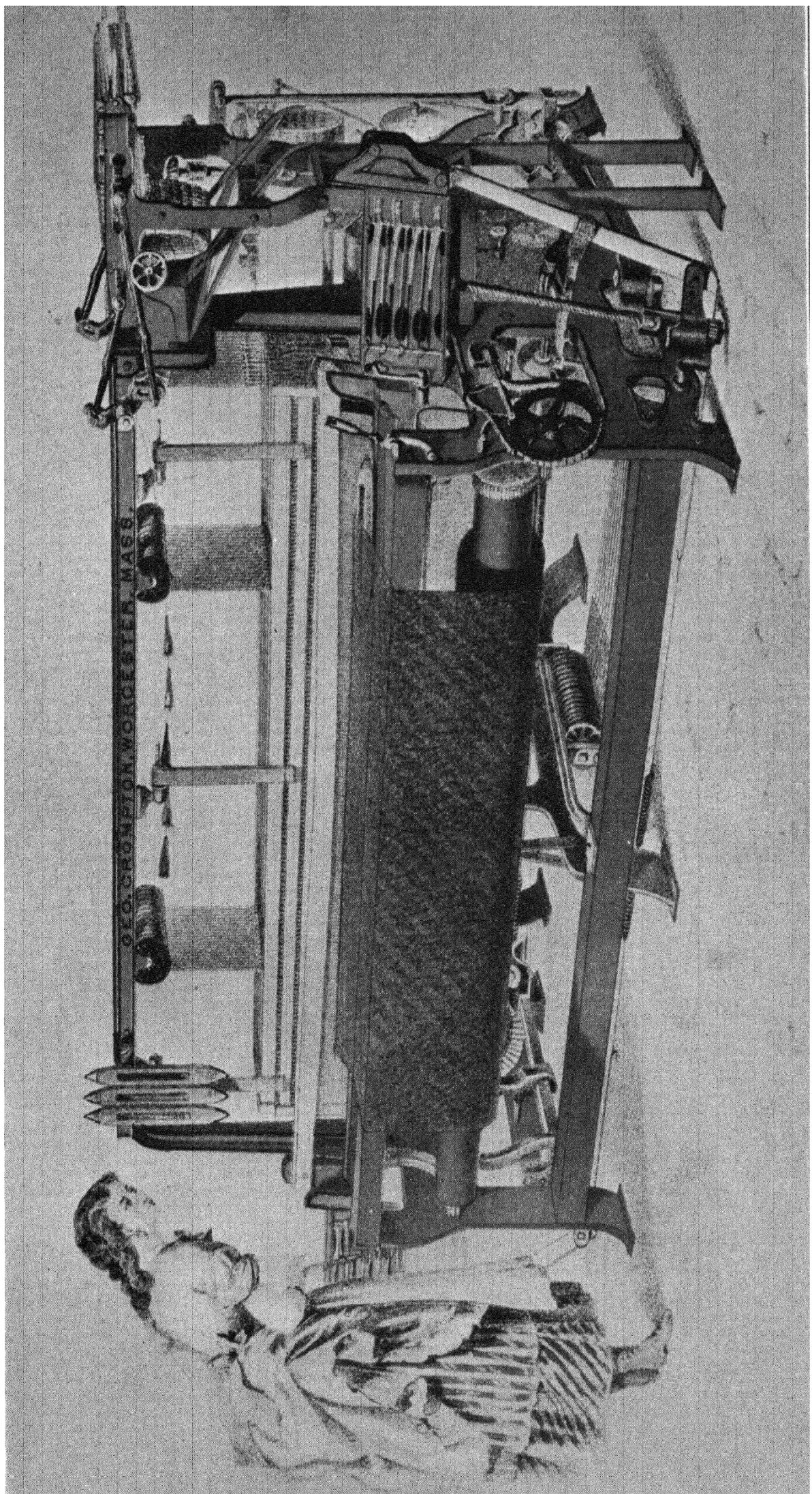
¹ Letter to the author.

² An Englishman writing on the competition between worsted and woolen manufacturers for the raw wool — and the conditions here and in England are not generally different — made the statement in 1912: "It can be taken for granted that the bulk of the wool long enough for combing purposes finds its way into the worsted branch of the textile industry" (*Bulletin*, 1912, p. 390). This is perhaps a rather extreme statement, but there is a substantial amount of truth in it.

severely by the importers of "clothing" wool, that short-staple wool used in the woolen manufacture. This class of material, on the average, shrank more heavily than "combing" wool, that employed in the worsted industry. With regard to the former, the manufacturers' *Bulletin* in 1897 stated: "Under the McKinley tariff, we were excluded from importing all foreign clothing wools, except those of lightest shrinkage, from Australia. The heavier wools of South America and South Africa, comprising nearly 500 million pounds, or half the available supply, were shut out, . . . because no manufacturer could use them, on the basis of the adjustment of the compensatory duties."¹ Under other "protective" tariffs the same condition would obtain, varying only in minor degree. The results are in fact evident in the ratios of foreign wool to the total volume of wool used in the woolen and in the worsted industries, respectively. In none of the Census years between 1869 and 1909 did the proportion of foreign wool employed in the woolen branch rise above 15.6 per cent of its total consumption. For the worsted manufacture, on the contrary, this ratio rose from a figure of 22 per cent in 1869 to one of 38 per cent ten years later; and it remained around that level through 1909. Finally, this case is strengthened still further by the statistics for 1919. In that year, under the regime of free wool, the proportion of foreign fiber used in the woolen industry jumped to approximately 40 per cent, while the ratio in the worsted end had increased only to 46 per cent.² The tariff tended to exclude more particularly wools which would have found employment in the older branch of the manufacture.

¹ *Bulletin*, 1897, p. 129.

² The statistics in the Census pertain to wool "in the condition purchased." From recent figures — wool consumption data under the tariff conditions imposed by the act of 1922 — it appears that a somewhat larger proportion of foreign clothing wool reaches the mill in a scoured condition than is the case with domestic clothing wool. On the other hand, more pulled wool — wool from the pelt slaughtered sheep — comes from domestic sources for use in the woolen manufacture than from foreign countries. Accordingly, as far as the ratios of foreign and domestic wools used in the woolen manufacture are concerned — the manufacture which uses chiefly "clothing" wools — there appears no reason for not taking the basis of "condition purchased" as substantially accurate. As for the worsted industry, almost all the wool consumed comes to the mill in the greasy condition; and



THE IMPROVED BROAD LOOM

As produced by Mr. George Crompton, loom-builder, under patent of 1871

Yet the increasingly eager competition for wool from the two sections of the industry was to some extent a world phenomenon. The woolen manufactures of Europe underwent much the same experiences as that of the United States. So a world-pervasive cause should be sought. This may be found in the more rapid increase of wool consumption than of wool production. A German investigator has estimated the quantity of clean wool annually made available for consumption in Europe and the United States — by local production and by importation — to have been around 2.4 pounds per capita in 1870 and to have increased by only about .4 pound by the close of the century.¹ World production has subsequently advanced somewhat, but, it appears, not enough to influence materially the quantity of wool per capita available in these countries. When we consider the expansion in employment of wool with the rising standards of living, with the larger wardrobes and the more frequent changes of wardrobes, the conclusion becomes obvious that the wool supplies of the world "just won't go around;" and for some time past this condition has affected the conduct of the wool manufacture.²

Because of market and technical factors, the woolen-cloth producer received the impact of these forces. It was the manufacturer of woolen, rather than the manufacturer of worsted goods, who had to find a remedy. And this remedy, practiced so comparison between foreign and domestic supplies presents no appreciable difficulty.

The exact data for the several Census periods are as follows:

	PROPORTION OF FOREIGN WOOL TO TOTAL QUANTITY CONSUMED					
	1869	1879	1889	1899	1909	1919
Woolen Manufacture .	10.1	10.4	9.1	15.0	15.6	39.6
Worsted Manufacture .	22.4	38.1	38.8	31.8	38.8	46.1

¹ Senkel, *Wollproduktion und Wollhandel im XIX. Jahrhundert: Zeitschrift für die gesamte Staatswissenschaft, Ergänzungsheft*, ii, 23.

² For the United States alone, the quantity of wool available for use per capita did not increase between 1870 and 1900. Actually, there was a small decrease: from 4.41 pounds in 1869-1871 to 4.16 pounds in 1899-1901. However, both the domestic production and the importations of Class I and II wools were abnormally low in the latter years; and it is sufficient for our purposes to assume no real increase. Similar figures for 1920 show a reaction to 4.50 pounds per capita, — a reaction due probably to abnormal conditions.

in foreign industries as well as in the United States, was the employment in a larger proportion than ever before of substitute materials. In England there has been an expansion of the Batley and Dewsbury industries, and in France the growing prominence of the delightfully named "Renaissance" trade.¹ The movement in the United States has been nearly as rapid. To be sure, this development was not without roots extending back into the earlier periods. Cotton warps had been used since the days of satinets, and recovered wool fiber or shoddy had been first utilized back in the thirties. However, the increase in employment of such materials in the decades following the Civil War was particularly great. Just how much was used in 1870, even as compared with 1860, cannot be accurately determined. The amount of cotton consumed in the woolen branch did not advance materially: only from about $15\frac{1}{4}$ million pounds to $17\frac{1}{2}$ million; and the amount of shoddy had risen from an unknown figure to one of 19 million pounds and more. But the quantity of raw wool used had doubled, mounting from 84 to 172 million pounds. After 1870, however, one can secure a fairly complete picture of the movement which surely had set in by that time. The trend is apparent in the following tabulation, wherein data for the worsted manufacture are included for purposes of comparison:²

¹ Batley and Dewsbury with the lesser town of Morley are the centers in England of the shoddy manufacture and of the production of shoddy fabrics. In addition, much recovered wool fiber is of course employed in other localities of wool manufacture. This substitute material alone, it has been estimated, formed in 1907 approximately a quarter of the total animal fibers employed in the British wool-manufacturing industry, whereas in 1857 it had made up only about 13 per cent (Clark, *Manufacture of Woolen, Worsted, and Shoddy in France and England*, p. 99).

"Renaissance wool" is the French name for shoddy.

² In order to get the amount of new wool in the cases of the two industries, I have added to the "scoured wool equivalent," as given by the Census, the weight of worsted yarn purchased by the woolen manufacture, and the amount of woolen yarn purchased by the worsted manufacture, respectively. Among the substitute materials are found: cotton, cotton yarn, wool wastes, shoddy (whether purchased or made up in the factory where used), and hairs. The small quantity of merino (or cotton and wool-mixed) yarns purchased by the two manufactures has not been included in either case.

Comparable figures are not available for 1870.

PROPORTION OF NEW WOOL TO THE TOTAL RAW MATERIAL CONSUMED
IN THE WOOLEN AND WORSTED MANUFACTURES

Year	Woolen Manufacture	Worsted Manufacture
1879	54.2	70.9
1889	42.7	67.0
1899	37.6	78.7
1909	34.5	85.5
1914	27.8	83.6

The picture needs no considerable comment. By 1879 the proportion of new wool (scoured equivalent of the greasy or other wools purchased) employed in the woolen branch had decreased until it was little over half; and in thirty-five years that proportion in turn had been practically halved. Of the materials which were substituted, those showing the greatest growth were recovered wool fiber (from 19 million pounds in 1869 to 65 million pounds in 1914) and wool wastes (from a figure which was probably negligible in 1869 to one of 38 million pounds in 1914). The latter material was chiefly composed of noils and of combing and other wastes from the worsted manufacture.¹ On the other hand, the worsted industry, after a small decline between 1879 and 1889, has shown a subsequent increase in proportion of new wool consumed. This is largely accounted for by the greater production of all-wool, in place of the earlier cotton-warp fabrics. Even the decline at the end of the table is fictitious, arising from the inclusion of mohair and alpaca among "hairs," which only in a limited sense would be considered properly as "substitute" materials.

The bearing of this phenomenon upon the development of the wool manufacture is many-sided. Two relationships are espe-

¹ Noils are the shorter fibers separated from the wool in the process of combing. It is just as good material as short-stapled new wool; indeed, in a sense it is just that. Its inclusion among the "substitute" materials is justified only because we are not discussing the proportion of wool of every sort that has gone into the woolen machinery, but specifically the competition of the two branches of the industry for new wool.

Of the American wool supply as of about 1870, Bigelow said: "More than four-fifths (of the American wool manufactures) are made from American wools. The coarse carpet-wools, which are not grown here at all, the worsted combing wools, and the fine clothing wools, which are grown by us only in limited quantities, go to make up the rest" (*Address at the Exhibition of the American Institute*, 1869, p. 5).

cially noteworthy. First, the utilization of so much cotton, shoddy, and wool waste in the woolen branch has tended to check differentiation in that manufacture. Yarns, except those of pure wool, cannot easily be standardized; and yet differentiation waits largely upon standardization. The trade in woolen yarns has not grown with the rapidity that the trade in worsted yarns has displayed; and the woolen manufacturer has preferred or has been compelled to carry his mixtures of new wool, shoddy, and whatnot from the carding machine to the finished fabric. Separate spinning mills have not prospered.¹ The second feature is somewhat connected with this first one: the use of such materials has stood in the way of standardizing woolen fabrics, and the paucity of standardization has checked the tendency toward large-scale production. There is nothing implicit to the woolen manufacture which would prevent the development of standardized products. Indeed, to a certain extent, as in certain fine flannels or in carpet yarns, the production of homogeneous articles does take place. However, the catalogue of standardized woolen products is meager. It is much briefer than that of the worsted manufacture, with its serges, clays, tops, yarns, unfinished worsteds, and the like. The intrusion of many materials into the woolen production makes the standardization of its output just so much the harder, while the possibility of a manufacturer's substituting cotton and especially shoddy in place of new wool makes more difficult the dealing by description which is so largely used in other fields.²

¹ See below, pp. 189 ff.

² See below, pp. 173-174.

Something should be said with respect to a strange phenomenon which made its appearance just after the close of the World War. By reason of the marked increase in general wages, or for some other cause, the consuming public, abroad as well as in the United States, began to demand fabrics of a fine quality in a volume never before experienced by manufacturers. The ratio of new wool used in the woolen branch rose from 27.8 per cent in 1914 to 41.1 per cent in 1919. The ratio in the worsted branch held relatively steady (82.1 per cent in 1919 as compared with 83.6 per cent in 1914), which, in view of the larger use of "hairs," probably means a small increase in the ratio of wool and hair combined. Again, there was an enhancement in the use of fine qualities in wool. The proportions of fine merino wools consumed in American mills in the years 1918-1921 were, respectively: 23.7 per cent, 38.7, 32.8, and 22.7 per cent. Such a movement, being nearly

Improvement in Wool Marketing.

The facilities placed at the disposal of the wool manufacturer for securing his supplies of raw material expeditiously and cheaply are important as a factor in the development of large-scale manufacturing operations. Merely an adequate supply of wool suitable to his needs is not sufficient; it must be brought to one or a few central markets, sorted, if not already prepared for sale, and held in anticipation of his normal wants. At one time, as we have noted, the American wool manufacturer was compelled to travel the country around his mill to collect the wool necessary for his operations. By the middle decades of the century, the wool trade was becoming better organized, and beginning to fulfill the services mentioned above. Yet many changes remained in store, even after the development that had occurred by 1870. Some of the features in the more recent history of the wool trade — those which touch the wool manufacture most closely — deserve consideration here.

Of first importance with respect to the period since the seventies is the increased geographical concentration of dealings in wool. While Boston in 1870 was a leading market for such trading, subsequently it has increased its prominence. This is evident in the handling of both importations and the domestic clip. As regards the former: in the years 1869-1871, Boston received on the average a little over 35 per cent of all wools brought into the country (statistics by classes are not available). Fifteen years later, when importations of Class I and II wools are first separated in the data for customs districts from the statistics of world-wide, would in any case have brought a derangement of wool prices from their pre-war normal relationships; but the disparities in prices between high quality and other grades of wool were intensified by the prevailing tendency in wool-growing — the trend toward crossbreds — which in fact the war itself had accelerated. Merino prices rose to undreamed-of heights; but some coarse wools were hardly above their pre-war levels. The movement of consumption and prices has since been back toward the pre-war normals, though there are still some differences, especially the active demand for merino wools. Have we a new factor of some permanence here? Are new factors active in the wool market? If so, what effect may be looked for in the field of wool-growing? and with what reaction upon the wool manufacture? These are questions which it is still too early to answer with surety.

general wool imports, Boston secured 56 per cent of such wools. Just prior to the World War (1912-1914) its proportion for wools of these varieties had risen to over 72 per cent. Moreover, the location in Boston of the chief or of branch establishments connected with concerns having world-wide interests in wool-dealing has assured the local market of due attention in the distribution of Australian, South American, or other wool production. Summer Street, Boston, where the wool-dealers of the city have tended to congregate, is known the world over in wool circles.

But in the disposition of the domestic clip Boston has come to play a somewhat similar part. In 1870 the Boston market took care of 35 to 40 per cent of such wool;¹ but by the years just prior to the war it was receiving approximately 70 per cent of the clip.² In the scope of its operations with the domestic wools, no other center approaches Boston, although a concentration of wool-dealing has gone on the country over. Nowadays little trading in wool is done outside of Boston, Philadelphia, and Chicago, with New York fairly important in regard to carpet wools.³

Several factors have contributed to the growing prominence of these few centers, and particularly that of Boston. The first and most important was the transference of our chief wool-growing area from the Ohio Valley to the Mountain states. Wool-dealers located in interior towns, from which they might well supply a few local mills, would find expensive the traveling necessary to reach the large western ranches; nor could they advantageously handle the large consignments from such western growers. Boston houses, and to a lesser extent Philadelphia houses, were better placed. The wool manufacture was sufficiently concentrated in or about these centers to assure merchants of ready sale for purchases or consignments of nearly any size. And this early advantage, as will appear, was later

¹ See above, Vol. I, p. 273.

² *Annual Reports of the Boston Chamber of Commerce*, showing receipts of wool at Boston.

³ In the importation of Class III or carpet wools, New York and Philadelphia have come to hold the greater part of the trade. Thus, in 1912-1914, they received 52 and 22 per cent of the total, respectively. A substantial portion of the wool imported at New York, however, is consigned to Philadelphia, it seems.

transmuted into a permanent one. Secondly, eastern wool merchants, and especially those of Boston, have had the support of specially adequate and enterprising bank facilities. By the aid of liberal credit, such dealers have been enabled to take advantage of any opportunities for extending their operations, and to meet any exigencies. Finally, Boston itself has proceeded far in the establishment of first-rate storage facilities, including the largest wool warehouse in the country. The latter, indeed, is sufficiently large to store a third of the ordinary domestic clip.

While other eastern centers have enjoyed some of the conditions favorable to the concentration of wool-dealing, Boston has been particularly fortunate. In fact, for wools suitable to cloth production, this city must be regarded as the American wool market *par excellence*. Here, better than elsewhere in the country, the domestic manufacturer could procure his full requirements for his principal raw material, expeditiously and on the best terms. New York and Philadelphia have maintained, perhaps increased, their predominance in the trade of carpet wools; Chicago has built up a substantial business with respect to pulled wools, — that by-product of the packing industry; and New York has a conspicuous place in the commerce of wool substitutes. But Boston unquestionably is the chief market for the most important raw material of woolen and worsted-cloth manufacture.¹

As one may easily imagine, the development of this market doubtless has had an influence in attracting new establishments for wool-manufacturing to the New England states, — at least the growth of Boston as a wool market and the localization of the wool-manufacturing industry in these states have gone hand in hand. From Boston, wool buyers journey through the wool-growing regions during the shearing season, if not before, and purchase the fleeces directly from the grower, or from the local merchant to whom the grower has already sold his clip. Brought east to the wool-dealer's warehouse, the wool is made ready for

¹ If proof were desired of the stability of the Boston market, note the attempts at various times to establish organized selling facilities — auctions and the like — at other cities. See Cherington, pp. 65-71.

the inspection by and sale to the wool manufacturer. To the mill-operator located relatively near a center of wool-dealing such as this, the opportunity thus offered for advantageous and easy purchases is of particular value. He has less need of carrying a heavy stock of raw materials, he can buy at the more favorable periods, and he can follow more closely the conditions in the raw material market. Accordingly, while the early (very partial) localization of the wool manufacture may have had some influence in building up Boston as a wool-trading city, unquestionably the reaction has been equally important: the extensive wool market there has made for a greater localization of wool-manufacturing within easy radius. In proportion, too, the development of a wool market in Philadelphia handling material for the cloth manufacture has been of influence in stimulating increased localization about that center.

But in methods of handling the wool, as well as in the location of that trade, there have been marked changes in the years since 1870. For example, a prominent worsted manufacturer, writing in 1898, spoke of the time twenty-five years earlier when all questions of fineness, shrinkage, and the like were determined by the "handling of every individual fleece." There was then, he said, "a body of men in this country, buyers for combing mills, who spent almost their entire time in going about the country or the large cities, . . . standing all day long at a table, at which fleece by fleece the wool that was already purchased was handed up for their inspection."¹ Today, to be sure, wool is still bought only after inspection by the prospective purchaser, but as a result of more careful grading and assembling of the wool by wool dealers, the trading can be put through after inspection of only a sample drawn from the several bales or groups of bales.²

¹ Mr. Charles H. Harding, *Bulletin*, 1898, p. 141. Mr. Harding asserted that when he wrote there were only three survivors of the earlier practice. Apparently, the woolen manufacturer could afford to be less critical of his purchases, — yet we have no opinion of such a manufacturer on the subject.

² Defects in wool-dealing were not wholly eliminated. As late as 1915 it was reported: "Without Governmental standards of length and degree of fineness, it will be impossible to classify the wool so as to meet exactly all buyers' ideas of quality. Today there are no clearly defined or generally accepted standards for

Again, in the field of wool substitutes, there has been progress toward better classification. In the seventies the market for recovered wool fiber was a rather confused affair. But now the sorting of such materials is carried to a high degree of refinement, while in the meantime has come an improved organization of the trade itself. Specialized houses or distinct departments of wool-selling establishments offer as efficient service as in the purchase of new stock. Such advances as these, obviously, facilitate large-scale mill operations, though of course in an indirect way.

Large-scale manufacture, on the other hand, has brought some modification in wool-dealing itself. Large individual mills, or a number of mills under a single management, now find it advantageous to send out buyers to negotiate directly with the wool-growers or local merchants who have bought from small sheepmen. "If the buyer is capable, the mill saves the profit made by the (wool) merchant, and on the large amounts of wool required for these mills this saving is a great advantage to the manufacturer."¹ Not all large mills or groups of mills pursue this course, and some employ both methods at different times. For our purposes it is sufficient to note that this elimination of the middleman is an indication of the increasing size of business units in the industry, and a sign of the industry's growing maturity.

In review we may say that the period since 1870 has witnessed a broadening of the range in wools acceptable to the worsted manufacture, accompanied by certain changes in the general character of the world's and incidentally of the American wool clip, which tended to favor that manufacture. Confronted with this situation, the older woolen branch of the industry has had recourse to a greater use of wool substitutes, — a feature tending to complicate the conditions underlying that section of the trade. Meanwhile, a betterment and a greater localization of wool. It may be graded, under the same name, differently in Boston, Philadelphia, and Chicago, and one year's grading will be different from the next" (*Textile Manufacturers' Journal*, quoted by Cherington, the *Wool Industry*, p. 53). The subsequent formulation and official adoption of wool standards by the Federal government should do much to better this condition.

¹ Hart, *Wool*, p. 119.

wool dealing has taken place, the latter in part arising out of the tendency toward localization in the manufacturing end, and in some measure tending to stimulate a further concentration of manufacturing within the given area. Finally, it is noteworthy that these several factors have given stability and maturity to the industry as a whole, and favored the development of large-scale production.

CHAPTER XXV

TECHNICAL ADVANCE

THE improvement in technical equipment is a basic consideration in dealing with the development of a manufacturing industry. Changes in that field often give the investigator clues as to the general nature of the development in the period which he is studying at the moment. With respect to the wool manufacture, the introduction of new apparatus in the years preceding 1830 foreshadowed the advent and elaboration of an advanced industrial form, the factory system. Modifications in mechanical equipment in the next period suggested the diversification in types of cloth fabrication, which indeed characterized the decades prior to 1870. Changes in the years subsequent to this last date are centered chiefly around the alterations in manner and quality of domestic cloth production, — the spread of large-scale manufacture in medium-quality fabrics, and the later introduction of higher grades of output on less distinctly a large-scale basis. In this matter, there are several features of importance, such as the origin of new machinery, the type of change effected, and the degree of advance over preëxisting apparatus.

First, attention may be given to wool-cleaning operations: wool-scouring, which is used in both the woolen and worsted branches, and carbonizing, which is particularly important to the first branch although occasionally employed on worsted staple. In wool-scouring, American machine-builders, taking the general bases of the Belgian and British apparatus, — the Leviathan and such like, which were developed abroad a decade or more prior to their use in the United States, — have carried this construction to greater lengths than our European competitors. The bowls are larger and more massive than the typical European apparatus; and this is of consequence in large-scale operations, enabling manufacturers to treat more rapidly heavy weights of

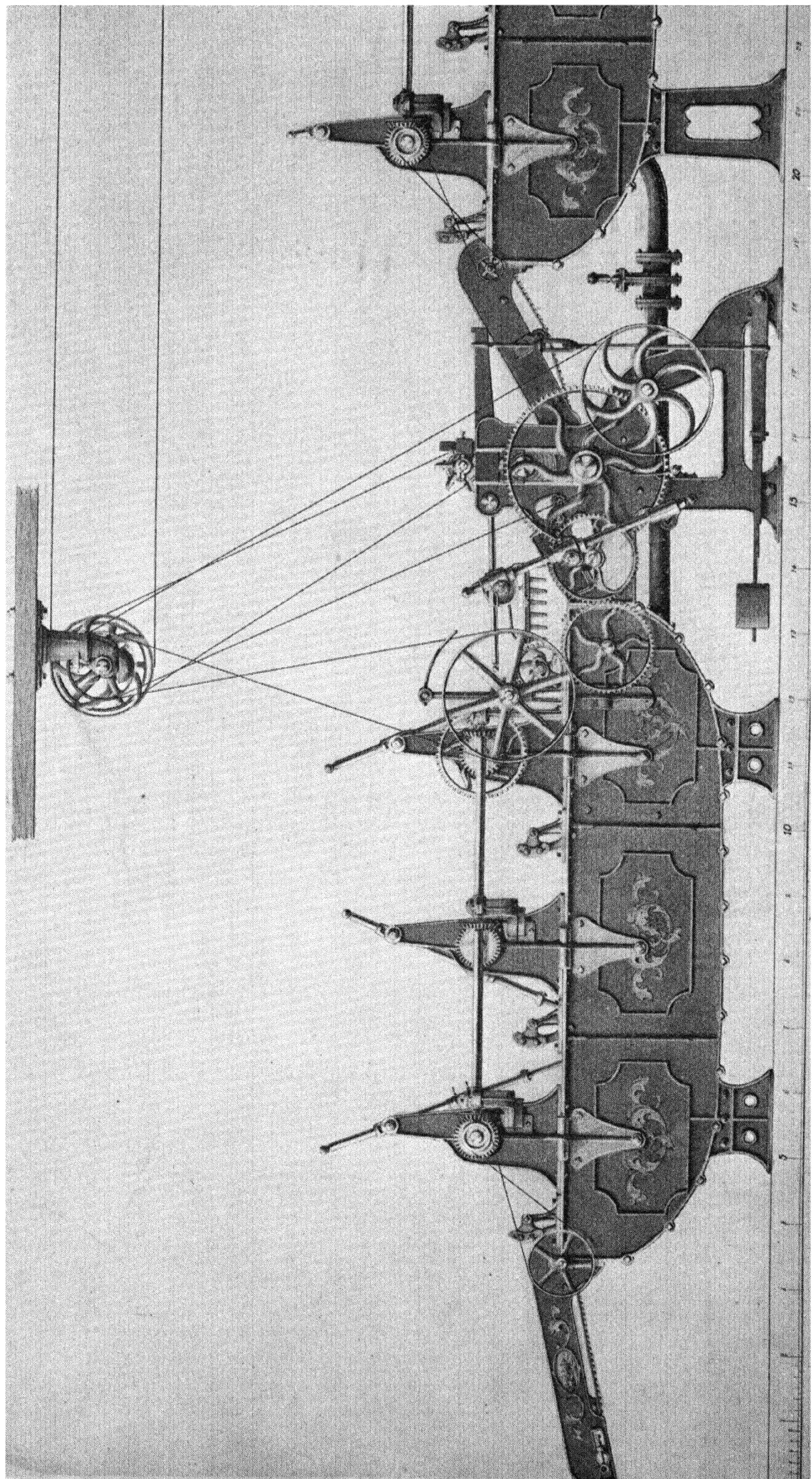
wool.¹ On the other hand, it is noteworthy as characteristic of American manufacturing methods that the treatment of burry wools has had more considerable advance abroad. The burr-picker of American invention, and the burr-cylinder attached to carding machines, are sufficient for the elimination of vegetable matter in wools which have no great admixture of such material. For the more burry wools, chemical treatment has been found more advantageous.

This method of burr-removal, called carbonization, is of Continental origin, being attributed to a German, Gustav Köber.² Introduced abroad first in the fifties, it spread with rapidity, coming into general use by the close of the sixties.³ But in the United States this process cannot be said to have made any considerable impression. Commission scouring plants usually include carbonizing bowls with their other equipment, but the employment of the chemical treatment is much less important there or in American woolen mills than in Continental establishments. Our manufacturers have preferred to utilize wools containing little or no vegetable matter. Chemical treatment for the removal of burrs is believed by manufacturers generally to weaken the wool fibers, and American manufacturers usually have not troubled themselves to learn the methods of working up such weakened staples. The peculiar character and arrangements of the Ameri-

¹ To some degree, the difference in organization of the American and foreign wool manufactures is responsible for the variation in size of scouring machines. On account of commission wool-scouring in England and on the Continent, the size of the wool lots, which scourers are called upon to treat, often run relatively small; and smaller apparatus is more suitable. This situation, however, does not seem to me to be fully satisfactory in explanation.

² Knecht, Rawson, and Loewenthal, *A Manual of Dyeing*, i, 152. The carbonizing process consists briefly of the following action: The wool, usually in the grease, is placed in large bowls or troughs, in which there is a solution of acid, usually sulphuric. After a submergence of about twenty minutes, the wool is carried to a drying machine or other heated chamber. Here the vegetable matter impregnated by the acid is rapidly converted into dry ash through the burning action of the acid. By passing the wool subsequently between rollers, the ash may be reduced to powder and removed.

³ Wachs, *Wollindustrie*, p. 27; Bousfield, *Woolens at the Paris Exposition*, 1878, p. 18. The latter, an Englishman, states that the process "is more used by foreigners than by ourselves."



THE FIRST PORTION OF A SCOURING SET

As built by C. G. Sargent's Sons in the early seventies. Note the mechanism for hand-feeding and the small size of the individual bowl

can tariff, too, have heretofore tended to discourage the importation of burry wools. Not only was there the direct disadvantage that the industry would have to pay duty, under the specific rate, upon useless vegetable matter, but it so happens that burry wools are frequently wools with a specially heavy shrinkage. Against the importation of such staple, the specific duties were a strong deterrent. With the recent change in tariff arrangements, by which specific duties are now levied upon clean-wool content, greater facility is extended to the importation of heavy-shrinking, and so more burry wools; but no great extension in the use of carbonizing in the American manufacture is probable. The decrease in strength of staple which comes from carbonization makes for difficulty in mass production of wool yarns and cloths. While domestic manufacturers of wool fabrics can avoid the use of chemically treated wools, they are likely to do so.¹

The domain of the worsted manufacture may well engage our attention now. Here, from the viewpoint of origin or source, there is a certain simplicity of development. The industry prior to 1870, it will be recalled, had secured from abroad the combing, drawing, and spinning apparatus which had been devised by trial and error in England. Introduction of the worsted-coatings production, the greatest single change in worsted manufacture since 1870, meant adjustments in the character of the machinery in use, and even the insertion of additional drawing operations;

¹ Domestic wool is free from burrs for the most part. Especially it is free from the so-called spiral burr which in South American wools presents so great a problem and cannot really be eliminated except by the carbonizing process. Accordingly, there has been no pressure from within the country to induce adoption of the chemical method of burr elimination. Cf. *Bulletin*, 1891, p. 37.

There seems to be no scientific basis for the view generally held among manufacturers that carbonized wool really damages the wool fibers. But undoubtedly careless execution of the process harms the wool. Prejudice and disinclination to run the risks of the operation may well account for the prevalent opinion in the wool manufacture.

The English wool manufacturer shares this same opinion — or, at least, he did so before the World War. At that time almost all the burry and faulty wool of the world went to the Continent for employment. During the war, carbonizing facilities increased in England, and possibly a change in practice may have occurred. What the permanent post-war situation there will be, is not yet clear.

but the equipment was not remodeled in an essential manner. It was distinctly the foreign apparatus of earlier years. Again, when the Continental method of worsted-yarn production was imported in the eighties and nineties, the equipment necessary for its performance was imported too. Nor has there been a subsequent independent evolution of American mechanisms. Domestic manufacturers have used chiefly types of apparatus of foreign origin, and even have equipped their mills with machinery of foreign construction.¹ Perhaps this is as might be expected. Mechanical methods and methods of production were largely set in a satisfactory form before American mills attempted any considerable worsted manufacture. Then, the presence of British and (later) Continental mill-men in the American industry — foreign-bred and foreign-trained proprietors, foremen, and boss-mechanics — tended to encourage the use of foreign-made apparatus. And, thirdly, only since 1898 has worsted-spinning machinery been

¹ The Tariff Board found the following proportions of foreign-built machinery in the domestic worsted manufacture in 1910 (*Report on Schedule K*, p. 1042), at least in the mills inspected by the Board:

	Per cent		Per cent
Carding machines	49.7	French combs	100
Noble combs	85.0	French gill-boxes	100
Gill-boxes, Bradford system	95.0	French drawing-frames	100
Drawing-frames, Bradford system	89.1	Worsted mules	100
Spinning-frames, Bradford system	91.6		

In contrast one may note the proportions of foreign-built machines in the woolen manufacture: woolen carding machines, 7.8 per cent, and woolen mules, 14.3 per cent. Machinery used in both the woolen and worsted manufactures showed the following figures: scouring machines, 45 per cent, and looms, 23 per cent. (The latter proportion is probably too high to be representative of the whole American industry. Ten per cent would be a more accurate figure than 23 per cent.)

Certain comments may be made concerning these statistics. (1) Care should be exercised in interpreting the data. Textile machinery may be nearly reconstructed from end to end, or more definitely from power-belt to the last bushing, and yet it will remain outwardly the same machinery. One cannot quote the Tariff Board's figures as indicating exactly the condition in the domestic industry. They are merely suggestive of tendencies. (2) The proportion of American-made machinery in the domestic mills seems to be growing. The Census statistics for combing machines indicate this movement. By successive decades the ratio of foreign-built combs has been as follows: 1879, 88 per cent; 1889, 80.8 per cent; 1899, 77.9 per cent; 1909, 79.7 per cent; and 1919, 70.2 per cent. (The discrepancy between the above Census ratio for 1909 and those reported by the Tariff Board for the two types of combs, I cannot explain.)

constructed in the United States; and this really was machinery only for the Bradford system of yarn manufacture, apparatus for the Continental system being neglected wholly until 1922.

Yet the decades since 1870 have not been wholly devoid of change important for our consideration. The tendency has been definitely toward the employment in American mills of larger and more productive machinery. The efficient Noble comb has driven out (or practically driven out) all other types of combing machines; and the capacity of this apparatus has been markedly increased. The massiveness and nicety in construction of spinning frames for the Bradford system, as well as the size in number of spindles per frame, have been increased; and the spindle speed of the dominant cap-spinning apparatus has been enhanced from around 5000 to 6000 or 7000 revolutions per minute.¹ Again, cone-drawing, a system of drawing specially adapted to quantity production from certain varieties of stock, has been frequently introduced into American practice. Most large mills have a few frames of this sort, and some few mills have a substantial number.² Indeed, with respect to all yarn-preparatory equipment in this system, there is considerable truth in the statement that "improvements have followed rapidly upon each other's heels; hardly a year passes without the application of some new device for the expediting or the simplifying of the various processes."³ Moreover, these improvements have tended chiefly in one direction, that of facilitating mass production and, as the writer just quoted says, of making "the manufacture practically automatic from start to finish."⁴

¹ Webber, *Manual of Power* (pp. 76-77), gives the speed in 1873-1875 of "flier frames altered to cap" in the Arlington and Manchester mills as 4575, 5025, 5025, and 5820 in the four cases quoted. According to similar figures for spindles in gill-boxes and roving machines, there has apparently been as great advance all along the line of worsted-yarn preparation.

² The cone-drawing system may be described as the utilization of two bevels for regulating the speed of the spindles (to which the bobbins are fastened) in accordance with the amount of roving on the bobbins. As the bobbin fills, the speed of the spindle is automatically and correspondingly diminished. This system puts less strain on the roving than does open drawing, in which the bobbins are loose upon the spindle and the roving is wound upon the bobbin under considerable tension. The device was developed in England.

³ *Tops*, published by the Arlington Mills, p. 94.

⁴ *Ibid.*

A less satisfactory report, however, can be made of worsted-yarn production on the more recently adopted Continental system. The yarns manufactured in this manner, to be sure, are somewhat standardized, the knit-goods industry as well as differentiated cloth-weaving plants taking a substantial weight in uniform types. But the characteristic features of the Continental system are more operations and lower production per worker than in the Bradford system, the employment of a higher proportion of adult male labor, and the devotion of the yarns to the manufacture of a higher quality of fabric.¹ Attracted to this country by the existence of a substantial protective tariff, the industry smacks more of the manufacturing conditions in the countries from which it came, rather than of those in this country which have sustained successful American manufactures.

As far as machinery is concerned, there has been even less initiative here toward building up a distinctive American equipment than in the case of the Bradford system. The presence of a larger representation of Continental mill-owners or managers, men who have accompanied the foreign capital going into the manufacture, may well be held accountable. It was perhaps to be expected that they would bring in and rely upon foreign-designed as well as foreign-built apparatus. To be sure, some improvement apparently has occurred during the last thirty years or so in the variety and capacity of machines imported and used in the industry. The Noble comb not infrequently has been substituted for the French comb formerly employed. Drawing machines and spinning mules are now of larger size. And all the machinery is constructed more solidly than in the earlier days. These have contributed somewhat to strengthening the Continental system. Yet the general character of the manufacture has not been changed, — a manufacture of rather un-American type carried on upon foreign-designed and largely foreign-built apparatus.

In the other branch of the industry, the manufacture of woolen goods, recent improvements have affected both principal

¹ See Tariff Board's *Report on Schedule K*, pp. 643, 1023 ff.

operations that are distinctively woolen, woolen carding and woolen-mule spinning. With respect to the former, advance has concerned the size of the machines, the intensity of their operation, and the introduction of labor-saving adjuncts to the main apparatus. While the American industry, despite foreign practice to the contrary, has largely retained the customary domestic form of a three-part apparatus, it has increased the breadth of each part.¹ In 1870 probably the majority of carding machines were less than forty-eight inches in width; in 1890, when the first figures are available, 35 per cent were still of such small size; but by the latest Census data only 13 per cent of the total number in American mills continued to be of such character. The domestic manufacturers have not followed European, and especially English, practice in the wide adoption of sixty-inch and even seventy-two-inch machines; yet apparatus forty-eight inches or more in breadth forms approximately 87 per cent of the domestic equipment.² Such larger machines, of course, are substantially more productive than the narrow apparatus of earlier times.

The manner of operation, as well, manifests the desire for greater productivity, as a comparison with European methods indicates. As early as 1886 it was noted by a technical writer that "the Belgians, French, and English drive them (the carding machines) slower than we do," thus being able to secure a better "working" of the wool.³ And I have no doubt that subsequent development has emphasized this divergence in practice. At all events, the investigator who now visits mills on both shores of the Atlantic is struck by the difference in this respect. English carding machines, for instance, have a thin film of wool on the workers and doffers of the card; whereas the intent of the Ameri-

¹ To a considerable extent the intermediate part has been combined with one of the other parts to form a double breaker or double finisher, — which is used with a single finisher or single breaker, respectively. This arrangement apparently is now more frequently to be found in American mills than it was a half-century ago. However, I find no appreciable significance for the American industry in this change.

² Thirty per cent exceeded forty-eight inches in breadth, — chiefly fifty-four-inch apparatus.

³ Brown, *Practice in Wool Carding*, p. 9.

can manufacturer seems to be to crowd through as large a weight of wool as possible within a given working time. While for the production of superior woolen yarns and fabrics such a practice is not desirable, — the wool securing inadequate manipulation or "working," — for other lines of output the advantages seem to outweigh the disadvantages.

Thirdly, note may be made of those accessories to the carding apparatus, — automatic feeds, intermediate transferring and feeding devices, and the final condenser arrangements, — some of which have already been mentioned.¹ With respect to all of these mechanisms the American manufacture has made substantial progress in the years since the Civil War. For example, the Bramwell feeding apparatus for the first carding engine, which was really introduced just prior to 1870, has been adopted throughout the domestic industry, — or, at any rate, mechanisms of similar character and function have been so adopted. By means of such a device, the wool is measured out and distributed evenly upon a traveling apron which conveys the wool into contact with the first, licker-in cylinder of the carding machine. Although attempts to accomplish the same end had been made abroad, this Bramwell apparatus, which is of American invention, first gave complete satisfaction. Today it is employed abroad as well as in American mills.²

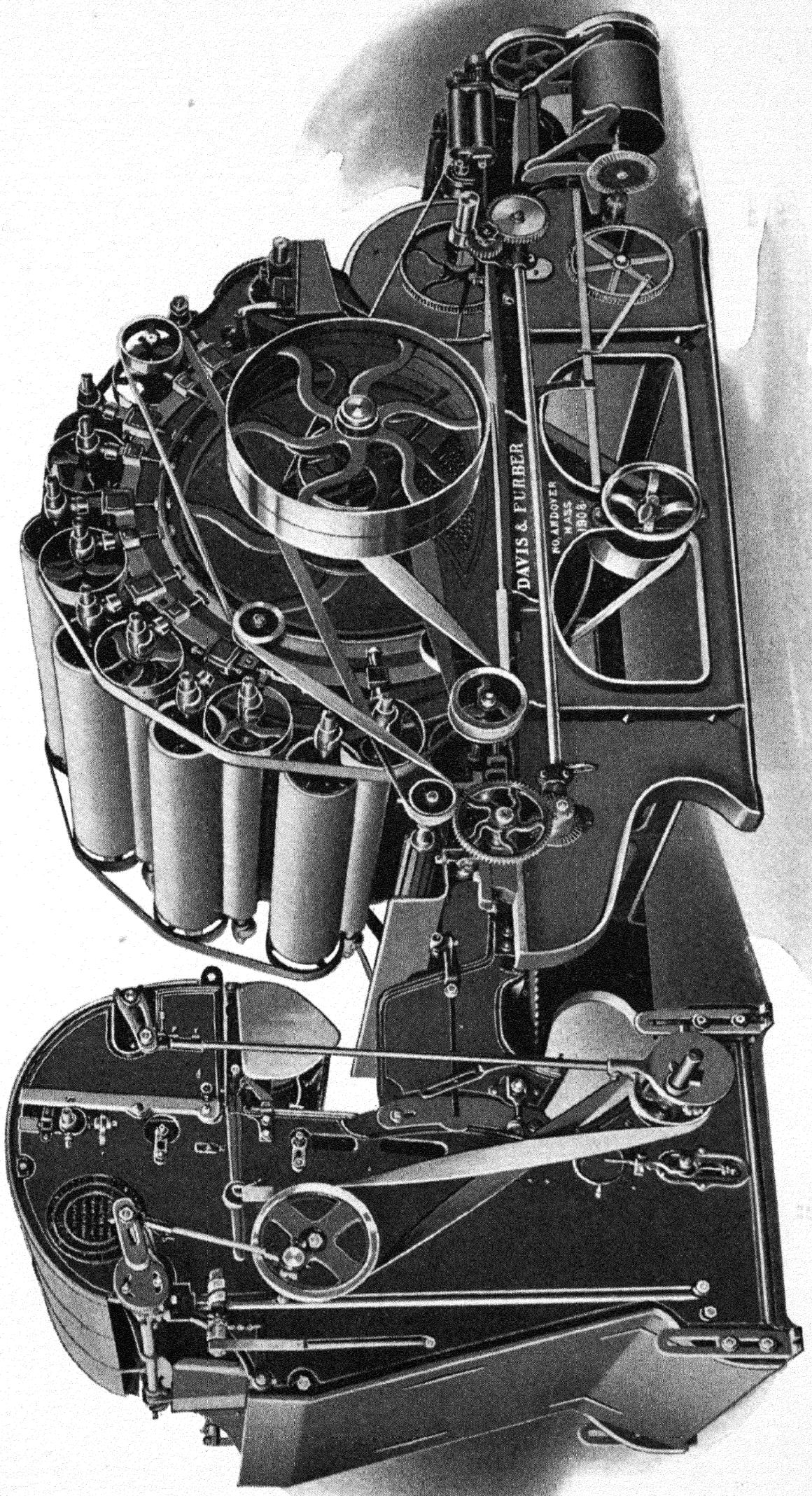
Intermediate feeds have now become universal in domestic establishments, the type most commonly employed being the Apperley. These were all invented abroad, but in the last three or four decades have come to form a part of the normal equipment in American mills. The labor formerly required for transporting the wool from one machine to another in the carding process is now eliminated, and the carding operation has become very largely an automatic affair.

Changes in the condenser apparatus form the last phase of the carding process that needs comment. Here the trend of development has been in somewhat different direction than that of the

¹ See above, Vol. I, pp. 353-358.

² For general discussion, see Bramwell, *Wool-Carders' Vade Mecum*, pp. 215-220.

Hand-feeding was not eliminated from wool-carding immediately upon the development of the automatic feed. In some mills it persisted as late as the nineties.



AN AUTOMATIC FEED AND THE FIRST (BREAKER) SECTION OF A PRESENT-DAY WOOLEN CARD

changes just mentioned. Automatic feeds and automatic transfer mechanisms concern the economizing of labor in putting material through the machinery. Modifications in the condensing devices have been in the way of producing yarns of higher grade, — i. e., yarns of smaller diameter, — to the production of which the industry in some degree has been driven by the decrease in weight of cloth demanded.¹ The industry has clung pretty well to the Goulding form of condenser, — ring-doffer, and the rest; but improvements in application, such as apron and roller rubbers and systems of multiple rubbers, have so changed the effectiveness of the apparatus that, were he alive, Goulding would marvel at the transformation. The devices named, especially the apron condensers, are essential to the modern tendency of splitting the sheet of wool delivered by the doffer into an increased number of individual sections or ropings. By increasing the number of divisions in the sheet of wool, each roping is of smaller diameter, and accordingly a fine yarn is more readily secured.²

As an alternate device for accomplishing the same end, an appliance recently imported from abroad is of service, the so-called tape-condenser. By use of this mechanism, the broad web of wool fibers drawn off the final cylinder of the carding machine is divided by close-running leather belts — belts one-half to three-fourths of an inch wide — into a large number of narrow strands; and these strands are rubbed together into ropings similar to those derived from the older, ring-doffer system. The chief advantage of this new apparatus is that a larger number of ropings may be drawn from a web of given breadth, and that from the smaller strands thus secured, finer yarns may be spun.³ The tape-con-

¹ See below, p. 150.

² One of the difficulties arising from dependence upon the older type of condensing apparatus may be illustrated by the experience of the Ballardvale Woolen Company. When they began the production of fine flannels, they were compelled to spin double, that is, to put the roping twice through the spinning machines, — at that time, jacks. Each operation reduced the diameter of the yarn somewhat; and a single operation would not have been enough (*Awards and Claims, Exhibition of 1876*, p. 82).

³ A closer description of the tape-condenser is as follows: The web of wool fibers from the final cylinder of the card is parted by figure-of-eight straps running

denser, it may be noted, is of Belgian origin, dating from the middle sixties; and for many years has been widely adopted in Europe. But the introduction into the United States on any appreciable scale, and the domestic manufacture of this device, occurred only in the period of the World War. Possibly the greater dependence then of the American market upon domestic manufacture with respect to the finer woolen fabrics that normally had been imported, may have been the particular impulse which brought about introduction of the apparatus at that time. Indeed, with respect to the more considerable refinement of the Goulding process and with regard to the adoption of this tape-condenser, the further feature is to be regarded: they have been encouraged in part by the trend of the domestic manufacture — examined below — toward the production of fabrics which are distinctly of high quality. In short, these latter changes in condensing mechanisms are comparable for the woolen branch to the addition of machinery for the Continental system in the worsted section.

Let us proceed to woolen spinning. Here the changes which have come since 1870 are particularly important. In 1870 the domestic manufacture was still employing the "hand-jack," a machine which could be operated only under guidance of a skilled workman. American manufacturers had long desired improvement of this method with the elimination of the autocratic and notorious jack-spinner; but as yet they had had no success.¹ Now this step became possible, — indeed, with the turn of the over two sets of cylinder rings, the intersections of these straps acting like scissors in dividing off the fibers. The straps deliver the strands to two or more pairs of apron rubbers similar to those of the ring-doffer system, which carry the strands forward for winding upon the jack-spool and in the process impart a false twist to them.

¹ "Within the last ten years (1869 on, but, as not infrequently happened, Mr. Hayes was somewhat inaccurate), the mill operators complained that one of their greatest evils was that they were subject to men employed as jack-spinners, who were generally foreigners, and had brought with them the disorderly habits of English workmen. Often on a Monday morning, half of them would be absent from the mill in consequence of the Sunday's dissipation. This retarded all the operations of the mill." And so arose the demand for machinery which would free the manufacturers from this "unreliable class of workmen" (Hayes, *American Textile Machinery*, pp. 31-32).

decade the change began. The earliest attempt at improvement was an endeavor to render completely automatic the preexisting semi-automatic "hand-jacks." Several inventors in 1869-1871 brought out attachments which could be applied to these older machines and by means of which this apparatus could indeed be made wholly automatic.¹ But the new "operators," as they were called, although a distinct advance over the semi-automatic affairs, were not altogether satisfactory. Especially, they could not stand the competition of the English mules, developed in the preceding period, which were already being imported into the domestic mills.² The mule was, to be sure, essentially the same apparatus, accomplishing the same end by substantially the same devices; but it was more strongly constructed, contained usually a larger number of spindles, and had a greater flexibility. The last was perhaps the determining feature. The "operator," for example, had but a single spindle speed, whereas the speed of the mule spindles could be adjusted to varying requirements. By virtue of this and similar differences, the mule was appreciably more adaptable to the variety of slubbings — thick and thin, strong and weak — coming from the carding machines.³

¹ The invention of a self-operating jack by a Mr. Kilbourn is spoken of in *Bulletin*, 1869, pp. 96-97; and one the next year by Messrs. William and Oliver Brothers of Burlington, Vermont (*Bulletin*, 1870, p. 149). Johnson & Bassett, machine builders, are said to have equipped the Chase Mills at Webster, Massachusetts, as early as 1870 with self-operating jacks of their own invention and construction (*Bulletin*, 1901, p. 276). Finally, there were similar machines built by Davis & Furber, which were the invention of one McGovern (*Bulletin*, 1901, p. 276, note). Machines of this last type, or at least certain portions of such machines, still exist and are still employed at the Olney Mills, Cherry Valley, Massachusetts; on which may be seen plates with the inscription "Patented by T. McGovern, — 1871."

² A pair of cotton mules were built for the Weybosset Mills, at Providence, Rhode Island, in 1865; and "were operated successfully for many years" (North, *Bulletin*, 1901, p. 275). Cf. also notice of the use of woolen mules, especially one called Lapham's (*Bulletin*, 1869, p. 97); and employment of such apparatus in a "few mills" before introduction of the self-operating jack (*American Wool and Cotton Reporter*, 1909, p. 883). The Blackinton Woolen Company of North Adams, Massachusetts, also had a few English mules about 1865 (interview with old employee).

³ *American Wool and Cotton Reporter*, 1909, p. 883. The statement is made (*Bulletin*, 1869, p. 97) by a machine-builder that his company had encountered

American machine-builders continued for some time to make operating heads or attachments for the old jacks, and to turn out new jacks with the special attachments; but steadily the apparatus of the mule type made headway, being added almost at once to the production of domestic textile machinists. In ten years' time, the transformation of American woolen spinning had made great progress, although "hand-jacks" are referred to occasionally in the early eighties.¹ This change, it may be added, meant a particularly great improvement in the domestic wool manufacture. The increased productivity flowing from the change was commonly placed at high figures. Simplification of the work was said to have allowed the substitution of boys for men, reducing the cost of labor 50 per cent, while the output was increased 25 per cent.² Without attempting a close estimate of the net gain by the transition, we can assert with Mr. Davis of Davis & Furber, the well-known mule builders, that "very much more work could be done per spindle (on the automatic mule) than was formerly the case with the Hand Jack. This

difficulty "in adjusting the English mules to the different kinds of yarn to be spun." See also Hayes and Mudge, *Report on the Exposition of 1867*, vi, 29: jack-spinning "is better suited to the different qualities and quantities of yarns demanded by the variety of fabrics usually produced in our mills." Also see North, *Bulletin*, 1901, p. 275. However, in addition to the direct evidence quoted above, the fact that the English mule rapidly conquered the entire field of woolen spinning seems to throw doubt on the accuracy of the statements just quoted.

¹ *Census of 1880*, xx, 380, 385, 387, 398, 399, 404, and 405. Moreover, hand mules still were in use in certain Philadelphia mills in 1880 (*Bulletin*, 1880, p. 29).

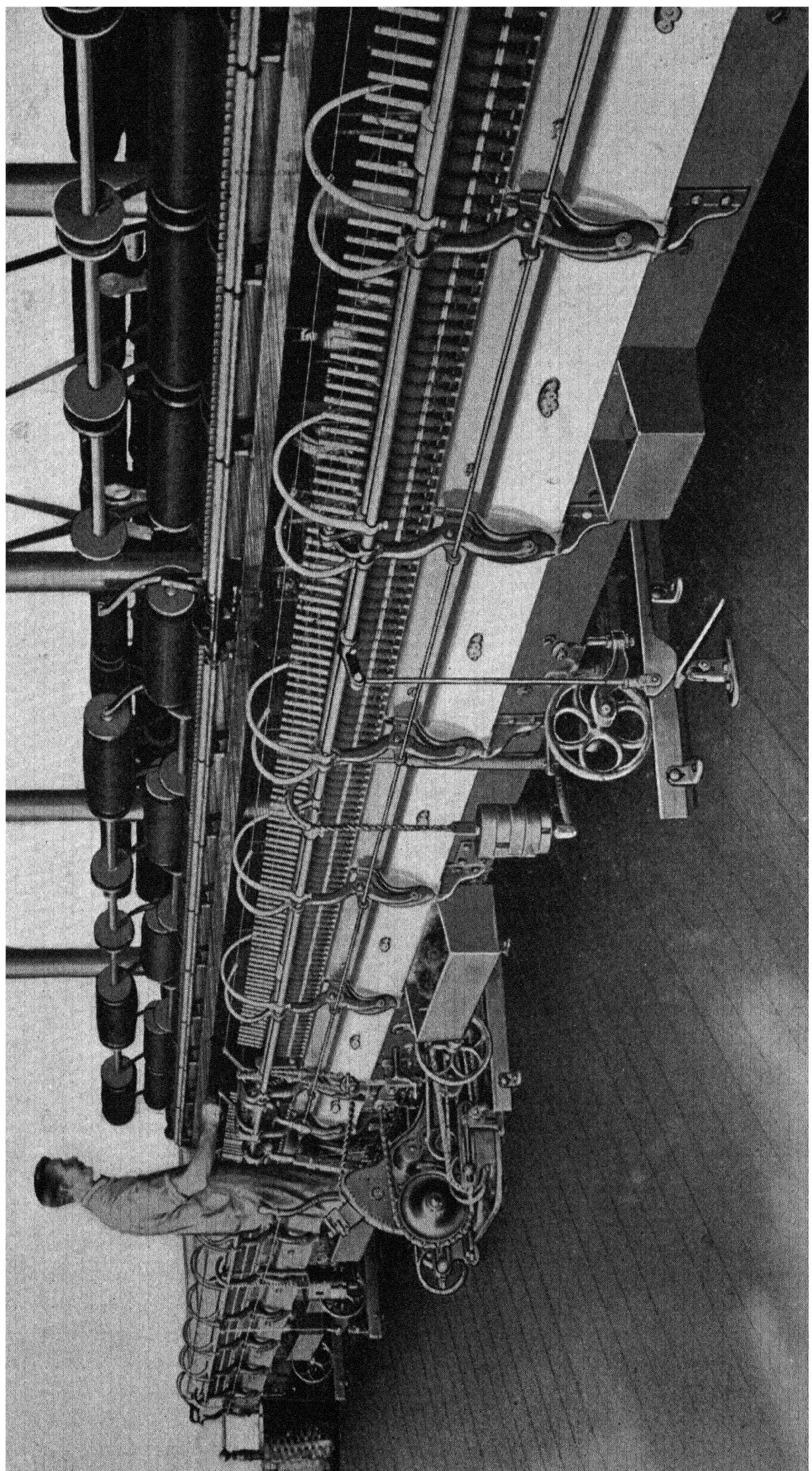
² Typical expressions in the *Census of 1880* are as follows:

Factory at Evansville, Indiana: "In 1875 self-operating spinning-mules were adopted, which have increased the output per spindle one-third and reduced the cost of labor per unit of production one-half" (xx, 385).

Establishment in Pennsylvania: "Self-operators have been substituted for power-jacks, and have so simplified the work as to permit the employment of boys in their operation where formerly men were required, reducing the cost of labor 50 per cent, while they have increased production 25 per cent. A boy (probably a young man) now does all the work formerly done by a man" (*ibid.*, p. 404).

Putnam Woolen Company, Putnam, Connecticut: "Self-acting mules . . . have been introduced . . . (reducing) the cost of labor in spinning one-half, requiring but one man where two were formerly needed" (*ibid.*, p. 380).

See also *Bulletin*, 1870, p. 149; *ibid.*, 1879, p. 280; *ibid.*, 1901, p. 277.



A WOOLEN MULE OF RECENT TYPE

The carriage or movable portion of the machine is here pictured as part-way upon its outward traverse

work (also) could be done better."¹ But the change had further significance. First, the hold of the jack-spinners upon the industry was broken, and the industry was no longer dependent upon the unstable assistance of these operatives.² Also, the new development marked the conquest by automatic machinery of the last important section of the woolen industry. Preparing, carding, weaving, and many parts of finishing had been subjected to automatic or substantially automatic machine performance; and such phases of woolen-cloth production as resisted the movement, e. g., wool-sorting or burling, have ever since remained essentially hand operations.³

There remains yet one important division of the technical process to be inspected, that of weaving, which of course is common to both the woolen and worsted branches.⁴ For the most part the development here has followed the lines laid down in the earlier period. For ordinary looms American wool manufacturers have clung steadfastly to those of the Crompton or Knowles varieties, though such mechanisms have been improved with further experience in their use and with changing demands for particular weights and styles of cloths. Moreover, the speed of the looms has been increased. To be sure, the invention of the Crompton fancy loom in 1857, raising the speed from forty-five to eighty-five picks per minute, was an advance greater than any single improvement achieved since that time; but pushing

¹ *Bulletin*, 1901, p. 272. Mr. Fisher (*American Wool and Cotton Reporter*, 1909, p. 883) intimates that the quality of yarn produced by the mule was superior to that turned out by the power-jacks. He speaks of his early training as a hand-jack spinner, when he had spun as high as six-run yarn "which was at that time about as fine a yarn as could be produced by the methods then in use."

² The adoption of self-acting mules also had an effect in diminishing the proportion of child labor in the manufacture. See below, p. 106.

³ Burling is a part of the inspection ultimately given the finished goods.

⁴ Advances in other lines have occurred, to be sure, — in winding, warping, and twisting, as well as in many phases of the finishing operations. Detailed description of these improvements is omitted, partly because evidence concerning these items is not so plentiful as in the cases of those outlined above, but chiefly because the effect of these others was merely supplementary to the major advances in carding, spinning, and weaving. Additional detail would have been presented without changing the main argument.

forward gradually, the nicer adjustment of looms and the improvement of individual parts in the mechanism have allowed acceleration in drive, until 100, 110, and even 125 picks per minute may be employed. Incidentally, we may note that the highest speeds are restricted to worsted weaving. The woolen looms are con-

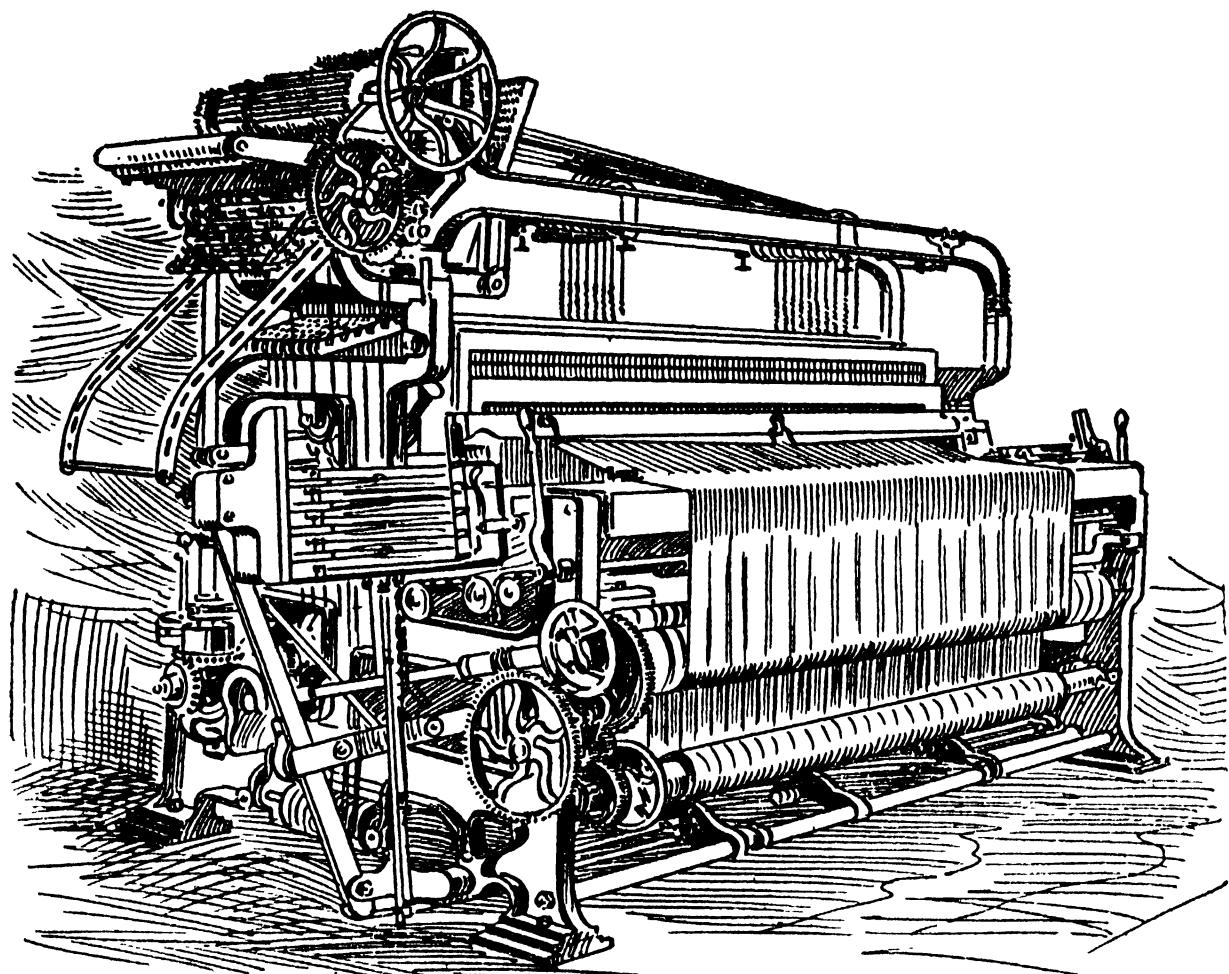


FIG. 16. The Heavy Worsted Loom as constructed by Crompton & Knowles in 1884.

fined generally between 90 and 105 picks per minute, the difference being due to the lower tensile strength of woolen yarns. So, while the whole industry has benefited by the advance in loom-speed, the manufacture of worsted goods — and especially worsted goods of the plainer types — has been aided most.

Another significant change in the character of weaving apparatus has been the steady advance in the proportion of broad looms. The use of such mechanisms, of course, goes back to the time when broadcloth was first produced in this country; and Crompton's fancy loom, it will be recalled, was a broad machine. At the time when data are first available concerning the proportions of broad and narrow looms, i. e., 1870, over 40 per

cent of the weaving apparatus in the domestic wool manufacture were of the broad type. Subsequently the trend has been marked in the direction of machines with a reed space of fifty inches or greater, — the Census making the division between narrow and broad looms at fifty inches, — until by the *Census of 1920* over three-quarters of the apparatus in the industry was of the broader sort.¹

In this development, at least two features are noteworthy. First: the change has been of greater moment in the worsted branch of the manufacture. Whereas as late as 1879 — the earliest period for which separate figures of the woolen and worsted branches are to be had — the older woolen section possessed broad machines to the extent of 45 per cent of its total loom equipment, the worsted mills contained but 22 per cent of similar apparatus; but within forty years the proportion of broad machines in the worsted branch had risen until it slightly exceeded that in the woolen end (78.5 per cent as compared with 76.9 per cent).² Secondly: the rate of change was rather uneven through the country, the Philadelphia region being particularly slow in adopting the newer variety

¹ For purposes of reference, the following statistics of weaving apparatus in the industry may be presented:

	Broad Looms	Narrow Looms	Hand Looms	Total
1869	14,039 *	20,144 *	†	34,183 *
1879	17,685	26,635	717	45,037
1889	28,876	28,958	349	58,183
1899	37,989	23,230	34	61,253
1909	53,893	19,006	41	72,940
1919	59,612	17,705	21	77,338

* Figures for woolen looms alone. In addition there were 6128 worsted looms, but for these the size was not specified.

† Not separately given.

² The proportions of broad and narrow apparatus in the woolen and worsted branches of the manufacture have been as follows:

	Woolen Looms or Looms Working on Woolen Goods			Worsted Looms or Looms Working on Worsted Goods		
	Broad	Narrow	Hand	Broad	Narrow	Hand
1869	41.1	58.9	*	*	*	*
1879	45.4	53.0	1.6	22.0	76.4	1.6
1889	53.3	45.9	0.8	42.5	57.2	0.3
1899	61.0	38.9	0.1	63.7	36.3	†
1909	75.5	24.5	†	72.9	27.1	†
1919	76.9	23.1	†	78.5	21.5	†

* Not separately given.

† Less than 0.1 per cent.

of loom. Even as late as 1899, fully half the worsted looms in Pennsylvania — which means chiefly the Philadelphia area — were still of the narrow type, while of the woolen-mill apparatus 60 per cent remained of this character. As in the case of the long persistence of hand looms in the Philadelphia region, this delay in the adoption of broad power-looms suggests the somewhat distinctive nature of the Pennsylvania industry.

For explanation of the general trend toward broad apparatus, one must look in part to marketing conditions and in part to technical development. The fabrics of thirty-five to forty inches in width produced on the older, narrow looms would serve well enough for the custom tailor and the domestic seamstress, but the large-scale operations of wholesale clothiers, especially the employment of a cutting machine for cutting out the separate parts of clothing, led them to desire goods of greater breadth. The rapidity of change in the worsted manufacture after 1880 when worsted coatings began to be produced, — for which the well-developed men's-wear clothing trade supplied a ready market, — is significant in this connection. And the improvement in operation of weaving machinery — the increased speed of broad looms, the devices for stopping the action of the machines when either warp or filling threads break, and the like — made more advantageous to the wool manufacturer the use of the broad apparatus turning out fabrics sixty-five or seventy inches wide.

Recent years have witnessed two further innovations in connection with weaving, the introduction of the direct loom-drives and the application of automatic weft-changing apparatus to woolen and worsted looms. The former is an important forward step in mill engineering, connected with the increased use of electrical power which has come in the last few decades.¹ By attach-

¹ The first note in the Federal Census that use was being made of electricity in the wool manufacture appeared in the report for 1899, but the amount of electric power consumed does not become significant until five years later. By 1919 this form of power had become of real importance.

The data with respect to type of power employed in woolen and worsted mills since 1870 may be conveniently presented here. Data upon the proportions among

ing a motor to each loom, greater flexibility is imparted to the action of the machine, and greater effectiveness in weaving is assured, especially in respect to the ratio of perfect goods turned out. And any increase in precision of operation achieved in such fashion is of course a distinct advantage to mass production.

The advent of the automatic weft-changing loom is an event perhaps more striking than the change in driving mechanism. Nor does the development lose interest from the fact that it has been particularly American, foreign industries drawing what automatic looms they possess (much fewer than in the domestic manufacture) directly or indirectly from American sources. The domestic wool manufacture, it is true, has followed the lead of the domestic cotton industry in this matter, and something like a decade intervened between the first adoption of automatic weaving in the latter and in the former production. The automatic loom for cotton weaving was put on the market in 1894, while similar apparatus was not employed in the wool manufacture prior to 1905. Moreover, the utilization of automatic looms has proceeded much further in the one than in the other industry. Latest information regarding the cotton manufacture indicates that 35 per cent of the cotton looms are on the automatic model, whereas probably not 10 per cent of domestic woolen and worsted looms are of this character. Yet the development in the wool-working branch is not to be ignored. The Northrop loom, the type used predominantly in cotton weaving, has been adapted to employment in the wool-manufacturing industry, though its field of usefulness is mainly the weaving of cotton-warp worsted fabrics. Then, a new form of automatic loom especially suited to wool-cloth production has been invented. The Northrop loom employs but one shuttle at a time, and so permits water, steam, and electricity as driving forces, limited to 1869, 1899, and 1919, will give the story. The proportions are based on horse power consumed.

	Woolen-cloth Manufacture			Worsted-cloth Manufacture		
	1869	1899	1919	1869	1899	1919
Water	62.0%	37.5%	23.6%	57.8%	21.2%	6.9%
Steam	38.0	59.4	43.3	42.2	75.7	53.3
Electricity	0.0	2.9	32.9	0.0	3.0	39.6

(The ratio attributed to electric power probably is underestimated. The Census data do not permit accuracy.)

the introduction of but one color in weft yarn.¹ The new Crompton & Knowles loom of the wool manufacture, on the other hand, is so arranged as to keep four shuttles active, or rather available for use; and consequently weft yarns of as many different colors may be utilized. The "mixing of the weft" thus allowed

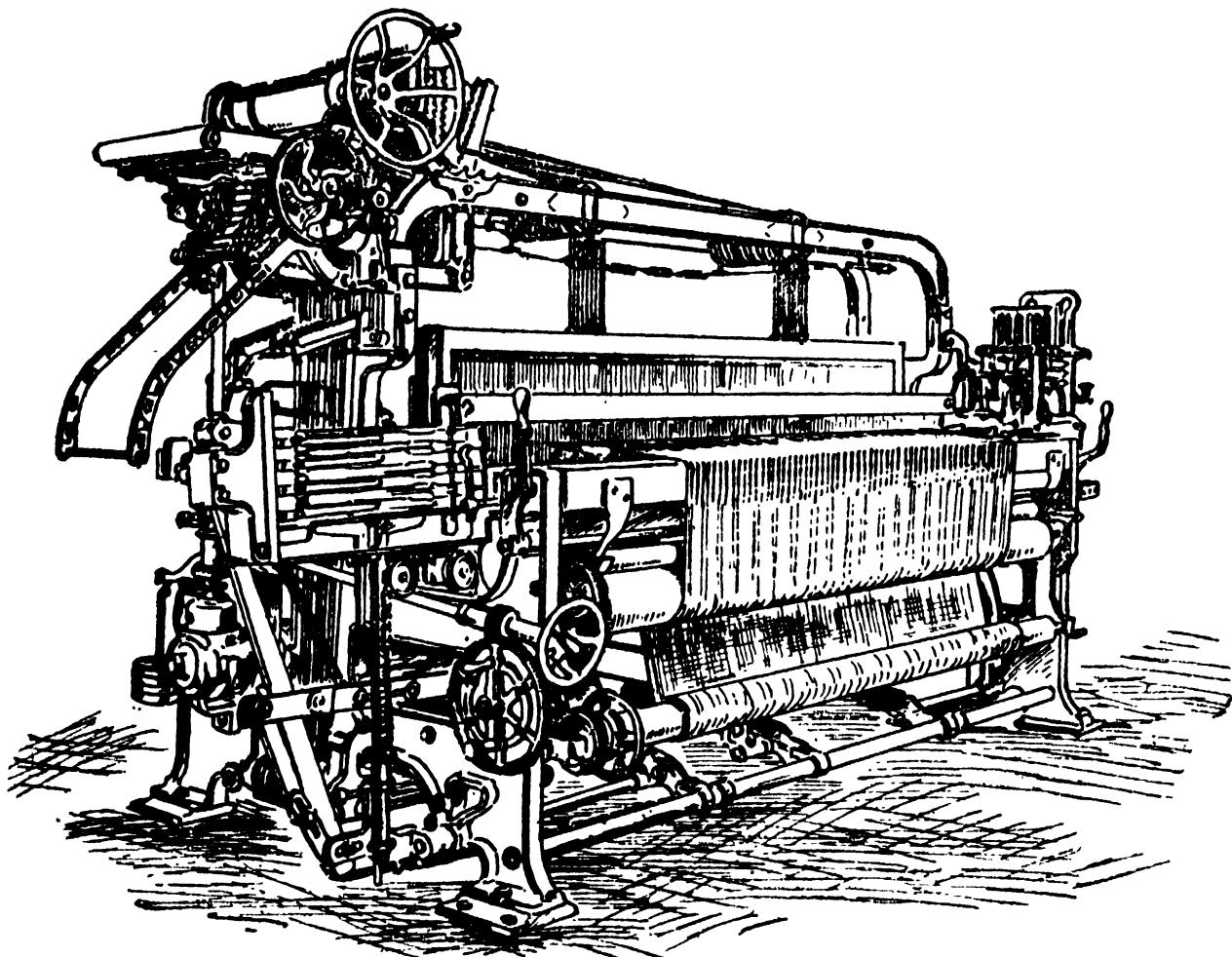


FIG. 17. The Automatic Worsted Loom as constructed by the Crompton & Knowles Loom Works in 1911.

is particularly important in the production of wool fabrics; and the possible variations in cloths are all but completely covered in this new apparatus. The people responsible for the development and introduction of this machine, the Crompton & Knowles Loom Works, assert that all known varieties of wool fabrics, save perhaps some five or ten per cent, may be woven on this form of automatic loom. Furthermore, though the proportion of au-

¹ The use of a single shuttle in the Northrop loom, it should be added, does not necessarily imply that the fabric produced is of a single color, since the warp threads may be of variegated hues. Furthermore, diverse shades and colors may be imparted to plain-woven fabrics in the dyeing process, of course, as well as differences of color between warp and filling through the employment of cross-dyeing. However, for the production of goods in which two or more colors of filling are employed, some apparatus other than the Northrop loom is necessary.

tomatic looms (of both types) is still distinctly low in the domestic wool manufacture, adoption apparently is proceeding with some rapidity, especially as old equipment is scrapped; and the situation promises well for the future.¹ This development, we may also note, like the increase in loom speed, seems as yet to favor the worsted more than the woolen section of the industry. Apparently the automatic loom has heretofore found employment chiefly in the former branch; and by reason of the weak character of woolen yarns, there is reason to suppose the use in the woolen end (barring important technical improvement, of course) will remain limited.

But as regards the whole problem of the use of the automatic loom in the wool manufacture, a word of caution is necessary. After the exceptional experience of the cotton industry in the use of this sort of apparatus, one might be inclined to put particularly great emphasis on the gain to be realized by the wool manufacture from the future employment of the mechanism. In fact, however, there is considerable doubt whether the automatic loom as at present constructed will be able to fill the place in the fabrication of wool that the corresponding machine fills in the allied manufacture. All wool yarns have lower tensile strength than cotton yarns of equal quality, and they are less homogeneous. Since, accordingly, there is greater danger of breakages in using the former, fewer automatic looms may be tended by a single weaver, — seemingly, six or eight as a maximum, compared with twenty-five or thirty in the cotton manufacture.² The advantages of employment in the wool manufacture are distinctly fewer. While, then, introduction of the new mechanism undoubtedly will increase, the movement may well be slower than it has been in the cotton industry, and the net

¹ A few concerns have made decisive change in their loom equipment, as for example the Farr Alpaca Company, which now employs Northrop looms alone; and in the war-time and post-war expansions of capacity, the adoption of the automatic loom has been quite conspicuous.

² To be sure, the automatic looms of the wool manufacture are broad machines, producing cloths fifty-four to sixty inches in breadth, whereas the automatic looms used in the cotton manufacture yield fabrics thirty-four to thirty-six inches in breadth; but this factor is counterbalanced by the fact that the latter machines may be driven at substantially higher speeds than the former.

effect upon productivity in the manufacture will probably not be so considerable.

As a final item on the technical side, I would point out the difference between modern mill buildings and those of earlier days. Here, to be sure, the force of inertia is particularly active, — the unwillingness of manufacturers to pull down an old mill structure just because it is not well suited to modern machinery or modern methods of operation. Machinery equipment will be replaced from time to time, but replacement of buildings is a much more serious as well as a more expensive affair. And, admittedly, there are old and inconvenient establishments in the domestic manufacture, especially among the woolen mills. Yet taking the industry as a whole, mill buildings are good, and they show a marked advance over conditions of 1870. Due to the rapid expansion in size of the American industry, to the increased geographical concentration, and to the tendency toward consolidation or combination among domestic mills, new plants inevitably were built. Such newer mills have borne witness to the imagination and ingenuity of our industrial engineers, and to the enterprise of American mill-owners. The tremendous window-spaces and the saw-tooth roof structure (specially valuable over weave-sheds) both indicate, among other matters, the progressive quality of the domestic industry. So too do the good arrangement of operations within the mill, making possible effective routing of materials or semi-manufactured goods, and the institution of labor-saving devices for transferring loose wool from place to place within the mill by means of forced drafts. On the whole, the condition of domestic mill buildings is better than that of structures in any foreign industry, while some of the finest American mills, such as the recently built establishments of the American Woolen Company, are not surpassed by buildings anywhere. And satisfactory establishments are important not only because of the opportunity of saving labor, but also because of the chance for the play of managerial ability.¹

¹ Sir Swire Smith of Keighley, England, a British machine-builder, speaks of our most extensive establishments as "the largest and best-equipped worsted fac-

Summary. The technical equipment of the wool manufacture has undergone important change in the decades since 1870. Indeed, practically every process has been improved, and taken together the advances in the several lines have meant a great increase in productive capacity. If he could inspect the machinery of the present day, the manufacturer of 1870 would recognize all the chief apparatus, — there has been improvement, but not revolution, — and yet he would be astonished at the enhancement of nicety and productive power of the existing equipment.

The changes in apparatus have tended steadily toward labor-economy and the elimination of skilled occupations. The introduction of the various feeding devices in the carding process, the complete automatization of the woolen mule, and the improvements in mill arrangements are cases in point; while the availability of the automatic loom enlivens hope for the future. Moreover, certain omissions in American factory machinery are significant in this connection. The hydraulic press has never found much favor in American mills, although it has a considerable vogue in European plants. Apparently, the labor involved in handling the cloth for treatment in these upright presses — the “papering” between individual layers of the fabric, and the like — is too great a handicap. American mills have stuck chiefly to the cylindrical press, and now have the satisfaction of seeing this machine making headway abroad.¹ Again, the domestic manufacture has not retained the hand-operated pattern looms which are quite conspicuous in certain foreign industries, especially where fine goods are being produced.

On the other hand, the conduct of the American industry has not always been above reproach. At times the manufacture has permitted its equipment or certain parts of that equipment to fall behind the best practice of foreign nations. Thus, when the tories in the world” (*Bulletin*, 1914, p. 209). On the other hand, there have been criticisms of the wool manufacture, especially the woolen branch. For example, see *American Wool and Cotton Reporter*, 1909, p. 881. .

¹ For the treatment of certain of the finer domestic fabrics, especially broad-cloth, where a high finish is desired, the hydraulic press has apparently always been used in the United States.

storm of the first large importations for several decades began to break upon the American wool manufacture in the middle nineties, observers began to make serious inquiries as to the state of the industry, and even friendly critics gave notice of unsound conditions. "The standard of efficiency in machinery, discipline, and management," it was said, "has been much lower in woolen manufacturing than in cotton manufacturing in this country. Woolen manufacturers have been slow to introduce improved machinery. Most of them are ready to keep the old stuff running as long as it will hold together, and lack the courage to throw it out and replace it with new."¹ Even the secretary of the National Association of Wool Manufacturers admitted that "there is probably some truth in the statement," made at the time, "that the high protective tariff has saved manufacturers from the necessity of learning these lessons (modern economies and the most modern machinery), to which the attention of foreigners has been largely directed of late years."² Moreover, comparison of present-day apparatus in the American and foreign industries shows important defects in the condition of the American equipment. The developments abroad of automatic doffing, of frame spinning both for woolen and Continental worsted yarns, and of especially fast "over-pick" looms are instances which may be quoted. Though these types of machinery have considerable significance in the various foreign manufactures, they have little or no part in the domestic operations.³

¹ *Textile World*, March, 1896, p. 18.

² *Bulletin*, 1894, p. 259. Writing in anticipation of the Wilson tariff, Secretary North had incidentally drawn a serious indictment of the domestic industry: "The mills which are to suffer most, and whose gradual wiping-out seems to be inevitable, are the smaller mills, chiefly engaged in the making of the staple, plain fabrics, and not capable of meeting the new conditions without a complete new machinery equipment. These mills have produced the bulk of the American manufactures of wool" (*ibid.*, p. 7: *Annual Report*).

³ Automatic doffing is a process whereby full bobbins may be removed from the spinning frame and empty ones substituted in a simplified manner. Whereas usually this work is done by hand, spindle by spindle, with the automatic doffer a whole side of a spinning frame may be "doffed" at one time by a mechanism operated easily from one end of the frame. This method of doffing has been increasing in importance in England during the last fifteen or twenty years.

The frame for spinning woolen yarn is a relatively new machine, as yet not much

Nevertheless, the performance of the American industry as regards technical advance since 1870 has been distinctly creditable on the whole. Compared with the equipment of any single European manufacture, that of the American industry at the present time seems equally satisfactory; and the arrangements of American mills are possibly better. To this end the rapid expansion of the domestic manufacture during recent decades, involving the construction of many new mills, has given much aid. The new establishments, such as those of the American Woolen Company, could be equipped with the most improved machinery and could be constructed with attention to the latest advances in engineering skill. Particularly important with respect to the general domestic situation is the fact that changes in the American manufacture during this same period, excepting the introduction of the Continental method of worsted-yarn manufacture, have been peculiarly well suited to the furtherance of mass production. Large-scale production of medium-grade goods appears to be the most advantageous occupation for the domestic industry in the face of foreign competition; and, accordingly, any step forward in that direction is to be welcomed as making for stability within the manufacture.

The future of technical improvement within the industry is problematical. There is some reason to suppose that a diminishing general rate of advance will prevail. Improvement in the wool manufacture, abroad as well as here, has been less rapid in the last half century than it was in the preceding decades; and the latter period in turn marked less considerable progress than the half century still earlier. Possibly in the American industry the next few decades will see merely refinement of exist-
used even in England, which is put forward as a substitute for the old woolen mule. On the other hand, the frame used for spinning yarns on the Continental system dates back thirty years or so, and is now extensively employed in France and Germany. It is just beginning to be introduced here.

The fast "over-pick" loom is utilized widely in England, and has been used there for many years. The "over-pick" refers to the method whereby the impulse is imparted to the shuttle — by a picker-arm above the shuttle-box, rather than one below as most commonly the case in American apparatus. American workmen object to the use of this over-pick machine, for to the weaver unaccustomed to it there is likelihood of serious harm.

ing mechanisms, an increasing utilization of such recently devised machines as the automatic looms, and presumably the gradual adoption of some or all of the apparatus now employed only in European manufactures. However, room for improvement of course still exists. Another Goulding may find means of eliminating the drawing operations of the worsted manufacture as the original Goulding found a method of so doing for the woolen branch, — though, admittedly, the task in the worsted industry is more difficult. Then, for the wool manufacture, as for all textiles barring the knit-goods production, the problem remains of remodeling the existing loom, a machine which is more wasteful of power than any other in the whole textile equipment. Yet these and similarly important opportunities for advance in technique involve such high technical obstacles that the practical manufacturer would look upon their fulfillment as quite improbable. Perhaps, indeed, the former supposition of diminished rate of advance is a more conservative estimate. But if a gradual and moderate progress alone be possible, that implies important relative stability and maturity for the manufacture, — a phenomenon, it may be remarked, which coincides with evidence noted elsewhere with respect to other aspects of the industry.

CHAPTER XXVI

LABOR CONDITIONS

DURING the period since 1870, changes in the conditions of the wool manufacture affecting labor have, on the whole, indicated a growing stability in the industry, although not in all respects have they added to the industry's competitive strength. We are interested chiefly in the part played by woman and child labor, and in the effect wrought by increased immigration. Incidentally, something as to labor turnover and hours may be included.

The variation in the proportion of women in either the woolen or worsted branch has been relatively slight during the past half century. Unlike the rather startling drop in the cotton manufacture, from a ratio of nearly 52 per cent in 1869 (62 per cent ten years earlier) to one of 38 per cent in 1909, the proportion of women wage-earners in the wool manufacture has not wandered far from the starting point. To be sure, the youthful worsted industry lost 5 per cent in the decade 1869-1879, but thereafter, when one could say the manufacture was firmly planted in its modern scope, the ratio has been comparatively steady. Particularly interesting is the reverse in the trend, which has occurred in this branch since 1899, namely, a small increase in the proportion of female workers.¹ In the older woolen branch, the ratio at the beginning of the period stood at 35.4 per cent, and since then it has stayed close by. In 1889 it rose to 39.2 per cent; but subsequently the movement has been downward, — in a direction

¹ The detailed data upon woman and child wage-earners in the woolen and worsted manufactures are as follows, in percentages:

	Worsted Manufacture							
	1869	1879	1889	1899	1904	1909	1914	1919
Adult Female	55.4	50.4	46.7	45.3	46.1	47.5	48.1	47.6
Children	14.7	15.4	8.9	9.8	10.5	7.0	4.9	5.5
	Woolen Manufacture							
Adult Female	35.4	34.0	39.2	35.6	33.8	34.3	31.8	32.6
Children	12.2	11.7	6.0	5.5	5.1	3.2	1.7	1.5

opposite that in the worsted branch. Moreover, one may note that at the close of the period as at its beginning, the proportion of women in the worsted manufacture stood substantially higher than in the woolen end: 47.6 per cent as compared with 32.6 per cent. The former figure, by the way, is materially less than the corresponding one for the silk-goods or for the hosiery and knit-goods industries, but exceeds not only that for the woolen but that for the cotton manufacture as well.

Meanwhile, the proportion of children employed in woolen and worsted mills has decreased markedly.¹ For the two branches together, the proportion in 1869 had been approximately 12½ per cent; by 1919 the ratio had fallen to less than 4 per cent. In the woolen end, child workers have nearly disappeared,—forming in the latter year only 1½ per cent of the total; but in the worsted branch a larger proportion (5½ per cent) has persisted. The decline in both sections of the industry is in part traceable to factory laws. The wool manufacture has become concentrated in northern states, all of which have screwed up their restrictions on child labor in somewhat uniform degree. Another influence, possibly of equal importance, has been the substantially independent development of more automatic machinery.² The failure of the worsted branch of the wool manufacture to reach as low a proportion as the woolen end follows from the difference in machine equipment. In certain departments of worsted-cloth production, especially in drawing and spinning, there is chance for the use of children, such as in doffing the spinning frames,—work requiring no peculiar physical strength, only quickness and dexterity of hand. Accordingly, in this country as abroad, a larger proportion of children have been retained than elsewhere in the wool-working manufactures.³ Compared with other textile industries in the United States, the wool manufacture as a whole holds a middle position, lower than cotton, silk, or knit-goods, but

¹ By children is meant persons under sixteen years of age.

² Other factors which have affected the wool manufacture in common with other industries of the country should not be neglected: compulsory school attendance, higher wages for adult workers, an aroused public consciousness to the evils of child labor, and the like.

³ On English situation, see Clapham, *Woollen and Worsted Industries*, p. 176.

higher than carpets. The worsted branch, however, has by itself a rather higher proportion of child labor than any of these manufactures, while the woolen section possesses a lower percentage than any.¹

The gaps left by the withdrawal of the children have chiefly been filled by additions to the adult male working force. The proportions of women, as we have seen, have not varied particularly, although perhaps the increase in the percentage of women in the woolen manufacture between 1879 and 1889 — from 34.0 to 39.2 per cent — may be accounted for in part from the synchronous decline in the proportion of children — from 11.7 to 6.0 per cent. The ratio of men in the worsted branch moved up rapidly from practically 30 per cent in 1869 to nearly 45 per cent in 1889; and in that neighborhood it has stayed. Similarly, the proportion of men in the woolen manufacture has advanced — although in this case steadily, save in the last five years — from a ratio of 52 per cent in 1869 to one of 66 per cent in 1919.² The early increase in the proportion of adult males in the worsted manufacture is to be explained by the change from the production of the lighter and simpler stuff-goods to that of the heavier and more complicated coatings and of the more intricate dress-goods fabrics. There was also some increase in the speed of the machinery. The more exacting work and the work involving heavier weights of material called for a larger percentage of men among the employees. The advance of the corresponding percentage among woolen operatives is explicable to some extent on similar grounds. The types of products have become more varied and have required a higher degree of skill; and the machinery has grown more cumbersome and harder to handle. Then, too, improvements in the organization of the mills and in the character

¹ The proportion of child labor in other textile trades was found in 1919 to be as follows: Silk-goods, 5.1 per cent; hosiery and knit-goods, 5.4 per cent; carpets and rugs, 2.5 per cent.

² The percentages of adult male wage-earners in the worsted and woolen manufactures, respectively, in percentages of the total numbers of operatives, have been as follows:

	1869	1879	1889	1899	1904	1909	1914	1919
Worsted	29.9	34.2	44.4	44.9	43.4	45.5	47.0	46.9
Woolen	52.4	54.3	54.8	58.9	61.1	62.5	66.5	65.9

of the machinery have permitted the discharge of women and children and the shifting of their work to the shoulders of adult male operatives. For instance, whereas the jack-spinner used to have one or two children dancing attendance upon his requirements, the modern mule-spinner with the aid of one or two adult workers cares for the whole spinning operation, and indeed for the performance of a substantially larger number of spindles. Again, the great majority of the women formerly employed in the warp-dressing process have been eliminated by virtue of the new apparatus used, and the workers there are now chiefly men. To be sure, some addition to the proportion of female operatives has during recent decades come in certain processes of the manufacture, notably in wool-sorting and in the drawing-in of the warps. But the net outcome has unquestionably been an enhancement in the ratio of adult male workers.

Inspection of the statistics upon the proportions among the several groups of workers leaves the impression that the two branches have respectively reached a point of stable equilibrium in the utilization of the three types of employees. (This conclusion, of course, assumes that there be no appreciable technical advance in one or more lines, and no further adjustment of the labor laws to drive out the 6500 children under sixteen years of age who still remain in the woolen and worsted mills.) Even the "dilution" of adult male help under the exigencies of the war period seems to have left no substantial, permanent impress, though it may account for the slight reaction in the percentages of men between 1914 and 1919. Apparently, the worsted manufacture is to contain around 5 per cent of children, and about equal proportions (around 45-47½ per cent) of men and women. And the woolen mills will hold about one-third women and two-thirds men, with a sprinkling of children for errand boys and minor helpers. Here, as we shall find in the case of technical equipment, maturity has resulted in a substantial stability.

Under such circumstances, the division of the work between the two principal elements of the working force, the men and women, becomes of interest. Enough has already been said of the jobs allotted to children, and these younger workers may here be

ignored. In treating of adult male and female labor, at least five groups of manufacturing processes may best be differentiated: (1) the supervisory, technical, and ancillary work; (2) the preparatory processes, common to both woolen and worsted; (3) the yarn preparation, and (4) the weaving, in both of which the two branches of manufacture should be distinguished; and, finally, (5) the finishing processes which, like the preparatory stages, have features common to the two manufactures. The utilization of men and women in these several sections is as follows:¹

(1) The supervisory, technical, and ancillary work is carried on almost entirely by men. For overseers, loom-fixers, and the whole mechanical department, men alone have as yet the qualifications necessary, although for supervisors of rooms such as mending departments where women workers predominate, women overseers are sometimes employed. To undertake the heavy work of lifting, cleaning, and the like, men in the rôle of general laborers are obviously essential. Within this whole group only one vocation, that of mill clerks, has a substantial percentage of women, and that obviously is only indirectly connected with the actual manufacturing processes.

(2) The wool-sorting, scouring, and carding operations are also distinctly the domain of adult male labor, partly on account of the skill and more largely on account of the severity of the work. In recent years, since the coming of the "new" immigration, a considerable number of Italian women and women from southeastern Europe generally have found places in these processes, especially in wool-sorting. They are also used in the shoddy-making departments of woolen mills, picking rags, attending rag-grinders, and the like.

(3) The yarn-preparatory processes of the worsted manufacture embrace particularly the wool-combing, drawing, and spinning, but with these operations may for convenience be included

¹ The best statistical data on this occupational distribution is to be found in the Tariff Board's *Report on Schedule K*, pp. 949-954, and 1008-1009. See also, *Report on Woman and Child Wage Earners*, xviii, 325; National Industrial Conference Board, *Research Report*, No. 12, pp. 6-13; "Report on Strike of Textile Workers in Lawrence, Massachusetts," in 1912, 62nd Cong., 2nd Sess., *Senate Documents*, No. 870, p. 90.

those intermediary between spinning proper and weaving, — yarn-twisting, spooling, winding, and dressing, or in general the handling of the yarn in preparing it for the cloth construction. In both of these groups of operations, women strongly predominate. Within the mills for which the Tariff Board secured figures, 4,949 women and only 1,295 men were employed in all these processes, excepting spinning. (The last must be excluded since, in the Board's data, woolen and worsted spinning are not separated, although conditions differ essentially.) In the combing operation, there is a considerable representation of men, particularly the lower-skilled and lower-paid labor from among the new immigrants;¹ and the dressing process is shared in a two-to-one ratio between adult male labor and immigrant female workers. By and large, however, the women have the field.

Worsted spinning and woolen spinning present appreciably different conditions. In the former, women and men divide the work about equally. The more important Bradford system of spinning, carried out on frames, employs quite a few more women than men. One calculation based upon "large" worsted mills of indeterminate number divides the workers in this operation into 34 per cent of men, 38 per cent of women, and 28 per cent of children (this being one of the operations, it will be recalled, where children still play a considerable rôle).² In the Continental system of worsted-yarn preparation, which employs the worsted mule spinning-machine, the reverse seems to be true; the number

¹ There is some disagreement among observers as to the proportions of men and women in the combing operation. The Tariff Board reported (1911) 52 per cent of males and 48 per cent of females in the combing process proper and 39 per cent of males and 61 per cent of females for the whole combing department (including gill-box and other machine-tenders). Elsewhere in its Report the Tariff Board differentiates between Bradford and French combing, including in each all the operatives in the combing departments, and gives the figures: for the Bradford system, 67.4 per cent males and 32.6 per cent females; and for the French system, 22.6 per cent males and 77.4 per cent females. The National Industrial Conference Board reported for the large worsted mills from which it secured data, 86.77 per cent of men, 10.51 per cent of women, and 2.72 per cent of children employed in "combing."

² National Industrial Conference Board, *Report No. 12: "Hours of Work as Related to Output and Health of Workers: Wool Manufacturing," Appendix C*, p. 69.

of men exceeds that of women workers.¹ Taking into account the relative ratios in the two branches, the percentage of children in each, and the relative size of the two systems in the domestic manufacture, we may estimate the proportions of men and women in the whole body of American worsted spinning to be about equal.

On the other hand, woolen spinning always has been and still is primarily men's work. Improvements of the mechanism and enlargement of the capacity of woolen mules have largely removed the young workers who once were numerous in the spinning rooms of woolen mills. The assistants or piecers are now more customarily young men, often apprentices in the art of mule spinning. The Tariff Board reported 94.1 per cent of the operatives in woolen spinning to be male; but probably this proportion includes a small percentage of boys. Perhaps around 90 per cent would be a fair ratio for men alone.

(4) Weaving as a whole, i. e., including both woolen and worsted-cloth fabrication, employs somewhat more men than women. The *Census of 1920* reports approximately 55 per cent of the former as against 45 per cent of the latter, — a relationship which had held in 1914 also. But by reason of the wide difference between the two sections of the industry, these average figures are not very valuable. To be sure, even within one branch of the industry, conditions vary considerably in the several parts of the country. Yet we may accept the evidence secured by the Tariff Board from a representative group of mills scattered through the northern states as indicative of the general situation. By its data, women operatives preponderated in the worsted weaving, attaining 56.1 per cent of all the worsted weavers tabulated; and men showed even a higher ratio, 60.8 per cent, in the woolen end.

¹ The Tariff Board presents the surprising figures that men and women form practically equal groups in French mule spinning, 50.1 and 49.9 respectively. The great mass of the women were employed as piecers. On the other hand, the National Industrial Conference Board credits men with supplying 85 per cent of the total, — though apparently this figure was based on a small number of cases. I am inclined to think from personal observation that the proportion of adult males was larger than the Board's figures indicate, perhaps 55 per cent of men and 45 per cent of women.

There seems to be no reason why some such proportions should not obtain at the present time.

(5) In the finishing departments of both manufactures, conditions are substantially similar. However, two distinct divisions among these departments may be made. In the first would be included the burling and mending, where the woven cloth is at once inspected, defects located and remedied. Here, except for cloth handlers, is a domain specially reserved for adult female labor. In all this work, women compose about 95 per cent of the total force. Contrariwise, for the other processes of finishing, including dyeing, pressing, napping, shearing, and the many other minor operations, men have the field, with proportions in the several departments running from 95 to 100 per cent.

This enumeration of the labor employed in the several processes and departments of the woolen and worsted manufactures brings out, among other things, the substantial handicap under which the woolen branch operates. Not only does it require the large proportion of adult male labor that the worsted section does in the supervisory, preparatory, and finishing sections of the work, but in the spinning and weaving operations it must call upon a larger proportion of men than does the other manufacture. If the difference between the two branches as to proportion of men arose merely from a greater amount of heavy work in the woolen branch, the situation would not call for special comment. However, the difference in the amount of arduous labor is not great enough to account for the existing variation. The chief cause for this variation is the greater skill necessary in the woolen branch as compared with that necessary in the worsted, or, conversely, the smaller amount of automatic work. This characteristic is noticeable all along the line of production: in the mixing of the "batch" for the picker and carding machine; in the minding of the woolen mule; in weaving, where greater diversity of weave and of fabric structure plays an important part; and especially in the various finishing operations. On the other hand, standardization of product, automatic or quasi-automatic operation in most processes, and simplification of the finishing work in the worsted manufacture make for substantially lower demands upon

skill there. This feature has an important bearing on the question of relative strength in the two branches.

To be sure, the possibility exists that the circumstances surrounding the two manufactures might so vary as to compensate for the difference in quality of labor involved. Such, for example, would be the effect of divergence in wage rates between the two sections. And there is some evidence that in wage scales such a compensatory divergence does exist, — or at least did exist before the World War.¹ In so far as they did exist, however, the lower wage rates for men in the woolen manufacture were apparently to be accounted for on the basis of the location of many woolen mills in small towns and country districts, where wages generally were on a lower level than in the more populous areas; and on the basis of the lower average quality of production in the woolen manufacture, with its cheap blankets, its low (part shoddy) cloths, and the like. But it does not seem that the divergence of wage rates in the two branches of the industry was great enough to be of particular moment. And lower wage scales for men in the woolen end were in part counterbalanced by higher rates for women.²

Yet with adequate allowance for this factor of varying wage levels, there is doubt whether the handicap against the woolen manufacture has been much altered. The additional skill and ingenuity required in that manufacture, with the consequent larger utilization of adult male labor, spell comparative disadvantage for its operations under American conditions, i. e., a disadvantage compared with other domestic manufactures. In so far as such an industry is subject to competition from these

¹ The Tariff Board (*Report on Schedule K*, pp. 1008-1009) presented figures of the percentages among the total adult male and female weavers earning certain wages:

	Adult Male Weavers Worsted	Adult Female Weavers Worsted	Adult Male Weavers Woolen	Adult Female Weavers Woolen
Weavers earning less than 20 cents per hour .	28.5	61.3	78.3	63.4
Weavers earning 20-29 cents per hour . . .	68.8	38.6	21.5	35.9
Weavers earning 30 cents per hour and more .	2.7	0.1	0.2	0.7

² See data in above tabulation. However, the Board's Report stated: "It was found that many of the female (worsted) weavers were weaving low-priced fabrics, for which earnings would be low" (*Report on Schedule K*, p. 1009).

other manufactures, — as the woolen branch is from the worsted end of the wool-manufacturing industry, or from the wool section of the knit-goods industry, — it will find its operations confined and its power of resistance curtailed. Like an industry based on poor natural resources, it has an inherent weakness.

The aspect of this matter, which is of particular interest here, however, is its influence upon the development of the two branches of the wool manufacture in the period since the worsted section became well established in the United States. The rapid expansion of the latter section while the woolen branch grew but slowly—of which more later—is, I believe, in significant measure the consequence of the features here emphasized.

1. *Immigration.*

The wool-manufacturing industry has been affected rather more than most American industries by the infiltration of foreign-born workers. The earliest immigrant additions to our working forces, it will be remembered, were skilled mechanics. Then, with the swelling tide of German and Irish immigration during the middle decades of the last century, many representatives of these races began to find place in domestic mills; and they were soon followed by the French Canadians, until in some sections of the country, e. g., in the Philadelphia district, a substantial, if not a large, proportion of the laboring force was composed of these foreign elements.¹

The movement after 1870 was in part a continuance of that long since initiated. The English, Irish, and Germans continued to come to our shores, though in smaller numbers, and they continued to find employment in wool-working mills. No unimportant part of the group securing such work was made up of skilled workers, as had been the case with the earlier immigration of these peoples. Thus it was reported in 1878 of the craft of dyers, a highly skilled trade, that those in American mills were “for the most part English, German, or French.”² Similarly, in

¹ In Philadelphia, the immigrant workers were mainly English, Scotch, and Irish.

² Müllender, Belgian delegate to the Centennial Exposition, *Bulletin*, 1878, p. 168. Mr. Folwell stated before the Industrial Commission (xiv, 215) that when

1910 the mill departments in which immigrants of these older types were found to outnumber the more recent arrivals were the supervisory, and the specially skilled operations such as loom-fixing, weaving, dresser-tending, and the like.¹ The accession of trained workmen from the European industries is to be looked for while the flow of immigrants continues; and even if immigration laws favor the "old" immigrants, probably the proportion of the latter to the total volume of workers in the mills will be no greater — very well may become less — than that found by the Tariff Board in its investigation, 28.4 per cent.

The "more recent arrivals," above referred to, form the item of chief interest during the last half century. These peoples came to us from Italy and other countries of eastern and southeastern Europe, most of them trained only in agriculture and scarcely any of them familiar with industrial work of the textile variety.² Yet in their new environment many immigrants of these nationalities sought the cities, and not a few the wool manufacture. The influx into the woolen and worsted mills began about 1890, and after that time, said the Immigration Report, "the greater part of the necessary labor supply (in the wool manufacture) was recruited from races of southern and eastern Europe."³ By 1910 the representation of this "new" tide had become peculiarly great in our mills. In several departments these workers had come to outnumber either American operatives or the "older" immigrants, and in one or two instances they surpassed both these latter together. Although the "new" immigrants have as yet secured only the less skilled positions, they have made much headway in the positions requiring chiefly strength and machine-tending. The several wool-mill occupations in which they were found proportionately most numerous by the Tariff Board were: the worsted manufacture was begun in this country "most all head-men had to be brought over from the other side," it being a new industry.

¹ *Report on Schedule K*, p. 956.

² The Report of the Tariff Board (p. 959) showed that only 11.2 per cent of the wool-mill operatives coming from Italy and eastern and southeastern Europe had previously been employed in any manufacturing or mechanical pursuit, and only 4.3 per cent in a textile trade other than woolen. On the other hand, corresponding ratios for other foreign-born workers equaled 22.6 and 13.8 per cent respectively.

³ *Reports of the Immigration Commission*, x, 649.

wool-carder, card-stripper, drawing-frame tender, and finishing-machine tender, 47-48 per cent of all such workers; twisting-frame tender, 54 per cent; and comb and gill-box tender, 68 per cent.¹ Nor is there likelihood that in the near future their representation will become less in the wool manufacture. Recently arrived members of this "new" immigration and the American-born descendants of the "new" immigrants who came in before the war seem destined to dominate the wool-mill working force of the immediate future.²

The influence of this newer influx upon the American wool manufacture as a whole is difficult to determine, especially as the degree to which it has been utilized has varied widely between sections of the country. Mr. Theodore Justice, a Philadelphia wool-dealer, spoke before the Industrial Commission of the fewer immigrants then among the mills of that region; indeed, he seemed to find satisfaction in that circumstance. "We have some advantages here," he said. "There is more American help employed in Philadelphia than in New England."³ On the other hand, the fine worsted manufacture around Passaic, New Jersey, has been built up largely from immigrant labor. The woolen mills of

¹ *Report on Schedule K*, p. 956.

A rather extreme case of predominating foreign population in a woolen-mill town is that of Maynard, Massachusetts, the site of the huge Assabet Mills of the American Woolen Company. The proportions in the population as given by the *Census of 1910* were as follows: American, 16.67 per cent; English, Scotch, and Irish, 33.42 per cent; Finnish, Polish, Italian, and all others, 49.91 per cent.

Proportions of native-born of native parents, native-born of foreign parents, and foreign-born in the woolen and worsted industries of typical states, as reported by the Censuses of 1900 and 1910, are:

Native-born	1900					1910				
	Maine	Mass.	N. J.	N. Y.	Pa.	Maine	Mass.	N. J.	N. Y.	Pa.
Native parents . . .	55.86	9.94	18.62	28.77	35.92	46.59	8.96	6.63	20.92	33.76
Foreign parents . . .	14.15	36.76	26.72	43.41	42.21	20.49	31.67	14.38	46.42	36.90
Foreign-born	29.99	53.30	54.66	27.82	21.87	32.92	59.37	78.99	32.66	29.34

² It is interesting to note what has happened to the American-born employees in wool mills. Apparently, they have been forced into the more skilled or enticed into the supposedly higher types of occupation. In the Tariff Board's enumeration, the proportions of native-born were specially great among the spinners, loom-fixers, and overseers for the men, and among the burlers and menders in the case of women (*Report on Schedule K*, p. 956).

³ *Industrial Commission's Reports*, xiv, 385.

Maine are equipped largely from native American workers or from the French-Canadian contingent; but in Lawrence, Massachusetts, the foreign-born population formed, in 1910, 48.1 per cent of the total, and native-born of foreign parentage another 26.3 per cent, or a total of practically 75 per cent, of which the "new" immigration provided a third. By 1915 the foreign-born and their children supplied 86.7 per cent of the total population of the city, with a probable increase in the proportion of "new" immigrants, although detailed information is not available.

On the part of wool-cloth manufacturers, there seems to be unquestionably a preference for native-born operatives, or at least a dislike for the new arrivals. I can quote two instances in point, besides the suggestion from Mr. Justice above noted. The Arlington Mills make it an argument in favor of their goods that "Arlington fabrics are profiting today (1921) from many past years of care in building up an intelligent and reliable working force. More than 75 per cent of the organization (of these Mills) consists of people born in America or of English-speaking stock."¹ Similarly, the Puritan Mill of Plymouth, Massachusetts, owned by the American Woolen Company, contained, when I visited it in 1915, quite a different type of workers from that in the Plymouth Cordage Company located across the town. In one the personnel seemed almost entirely native-born with perhaps some French-Canadians; in the other were chiefly Italians and other south-Europeans who had formed a little village in the neighborhood of the mill. One factor influencing the wool manufacturer is the unwillingness of the operative to remain in a given mill or even in the industry after he has once entered. The Arlington Mills, for example, say that "the 'floating' element is conspicuously absent" from their staff. And other data tend to show that the Italian and other representatives of the recently arriving races are less stable than the mill-hands of other stock,—of which more will be said shortly.² But beyond the immediate industrial factor

¹ Pamphlet entitled *William Whitman & Company, Inc.*, published by the textile merchandising concern of that name (1921, p. 33). The Arlington Mills, located in Lawrence, Massachusetts, is one of the establishments controlled by William Whitman & Co., Inc.

² See below, pp. 120-121.

may be the social consideration. Manufacturers have doubtless been hesitant about encouraging the settlement, in the town or small city where the mill was located, of a large body of such immigrants. They are frequently mere transient residents of the country; they are not easily miscible with the rest of the population; and their alien habits of life and thought often evoke serious problems for the city or town-fathers. On the other hand, such immigrants do provide a supply of cheap labor, and labor which is satisfactory for many occupations within the mill. Furthermore, with the expansion of the industry, it was perhaps inevitable that this new element should be drafted. At least, drafted it was; and from its increasing share in the manufacturing operations have arisen new difficulties in production, only in part compensated by the lower wages paid. The character of the domestic wool manufacture has been greatly changed; and this change should be given a prominent place in a description of the modern American industry.

2. *Hours of Labor.*

The movement toward shorter working hours in wool factories, which had begun in the earlier period and had gathered much headway by 1870, continued vigorously after that time. The early legislation concerning mill hours, sometimes limiting the work-day to ten hours, was but partly effective. "As a matter of fact, public opinion had been roused to favor a ten-hour day, but had not yet grasped the technical difficulties of its enforcement." Most of the early laws allowed the employer to "contract-out," that is, to reach agreement with his operatives individually for ignoring the law. Moreover, such legislation was frequently restricted to corporately-owned establishments, and plants under individual and partnership ownership were still common.¹

A new era came with the enactment of a strict ten-hour law by Massachusetts in 1874, — a law which carried teeth for its enforcement. Then followed within the next fifteen years the passage of similar legislation in all the other New England states. Action in other wool-manufacturing states was delayed. New

¹ *Report on Woman and Child Wage Earners*, ix, 69-72.

York adopted a ten-hour law in 1886, and New Jersey in 1892; while Pennsylvania maintained rather more backward regulations right up to the World War, although in 1897 enacting a maximum working week of sixty hours, and although manufacturers themselves commonly had reduced hours below the maximum allowed by law. But meanwhile the first states had proceeded on a pace or more, until by the years just preceding the World War it was customary in wool manufactories throughout the country to work between fifty-four and sixty hours per week. In 1914, according to the Census, 55 per cent of wage-earners in the woolen and worsted manufactures together were putting in fifty-four hours a week.¹

The change in hours of work between 1914 and 1919 was startling, more rapid than in any other half decade in our history. By the latter date, practically three-quarters of the employees in woolen and worsted mills had been able to diminish their work-week to forty-eight hours or less. Only about 18 per cent were putting in the fifty-four hours or more, which had been the working period in 1914 for 98 per cent of such operatives. The change came principally after the close of the war, when in the boom period of 1919-1920 the workers without any extreme effort were able to secure a wide adoption of the forty-eight-hour week or at least a material reduction in hours. Establishments in some of the important wool-manufacturing states, e. g., Maine, Connecticut, and New York, were in 1919 still largely working in excess of forty-eight hours per week; but the trend was unquestionably toward a maximum of that duration. A pre-war normal of fifty-four or at least fifty-four to sixty hours had become a post-war normal of forty-eight hours.

¹ The Census has since 1909 given data on the number of wage-earners employed at various lengths of working week. Rendered into percentages of each total number of such earners for the several years, these data give the following tabulation:

	Between 44 hrs. or less	Between 44 and 48 hrs.	Between 48 hrs.	Between 54 hrs. 54 hrs.	Between 54 and 60 hrs.	Between 60 hrs.	Between 60 and 72 hrs.	Between 72 hrs.
1909 . . . . .	..	..	X *	X	X	71.7	26.2	X
1914 . . . . .	..	..	X *	1.4	55.6	35.8	6.6	X
1919	X †	5.9	68.6	7.0	10.7	5.9	1.1	X ‡ ..

X Less than 1 per cent.

* 48 hours or under.

† 44 hours or under.

‡ Over 60 hours.

Apparently, this last reduction in working time has meant an appreciable decrease in productivity per worker, — a result which may well not have followed previous declines. Moreover, since the pay of time-workers (as opposed to piece-workers) was usually retained at the preexisting rate for the longer hours of mill operation, this decrease in productivity would be immediately reflected in higher production costs. Even in the case of piece-workers, where the wage rates were customarily maintained at their old level, the overhead charge per unit of product would be somewhat enhanced by reason of the shorter work-period for the machinery or general plant equipment. Allegation of decreased productivity has been frequently made, but as yet data permitting a clear conclusion and an approximate measurement have not been made available by the industry.¹

3. *Labor Turnover.*

One of the chief evils in modern industry — from the point of view of maximum production — is the frequency with which workers change their jobs, from industry to industry, from mill to mill, and from occupation to occupation. Though there is little or no evidence on either side, one gathers the impression that the early manufacture suffered much less from this difficulty. The picture of the isolated mill village, company houses, company store, and the like comes to mind. And undoubtedly much of the modern evil may be laid to the increased facility of movement, the increased fluidity of information, and the enhanced restiveness among employees that flows from such improved means of communication. The influence of this factor is indicated by the

¹ As early as May, 1919, it was said (*American Wool and Cotton Reporter*, vol. 33, [1919], 1616) that the "reduction in the hours of mill operation" had "affected the yardage of goods which can be produced." The writer admitted, however, that "manipulation in fabric construction" had helped to counteract this loss somewhat; and that other industries were suffering a "decline in efficiency" as was the wool manufacture. The difficulties in measurement lie in separating these three factors: actual decline in productivity, change in character of the goods produced, and variations in efficiency not connected with the alteration in working hours. Such figures as we have as yet, e. g., the report of the National Industrial Conference Board, *Research Report*, No. 12, 1918, have not given opportunity of isolating the single influence of fewer hours.

Tariff Board's comment, that "many of the (American) woolen and worsted mills are located in small villages and towns remote from large cities or large centers in which other industries are carried on. In such localities there is more steadiness and permanence of employment in the mills than in the larger centers."¹ There can be no question that labor turnover has in recent decades evoked much more discussion than ever before. Probably we are warranted in assuming a much increased movement for the industry as a whole.

Much information along this line was gathered by the Tariff Board in 1910, and considerable emphasis was placed upon this factor as one of the important disadvantages under which the American wool manufacturer labored. The best single piece of evidence presented by the Board is a comparison for a representative group of establishments between the total number of persons employed in the years of 1907 to 1911, including those hired and dismissed, as compared with the average number held each year. (Those persons hired more than once during a single year are included but once.) During this period the worst showing was for 1907, apparently due to the influence of good times at the peak of the up-swing in business culminating in that year. While the average number of persons required for the mills or the number held was 11,178, a total of 29,402 different persons were employed at one time or another during that year, or an excess of 163 per cent. For every ten operatives needed in the mills, twenty-six were taken on for a shorter or longer term. In other years this excess fell as low as 113 per cent, — specifically, in the depressed year of 1908. For the five-year period, the average excess works out at 136 per cent.² It is notable with respect to these data that the flux in the case of women is substantially greater than in that of men. The ratio of excess for operatives in the burling, mending, and examining departments, where women have the field almost to themselves, ran consistently higher than the ratio for any other process. Figures of 267 and 298 per cent of excess are recorded for such operatives. Such higher rapidity of movement is perhaps to be expected among women, because

¹ *Report on Schedule K*, p. 982.

² *Ibid.*, p. 983.

of the withdrawals that accompany marriage. For instance, the proportion of women over twenty-five years of age employed in the mills (according to another inquiry) is much less than that of men in the same age group: 28.3 per cent as compared with 62.6 per cent.¹ Then, as the Tariff Board said, "some of the young women tire of being 'mill hands' and leave to become clerks in department stores or to enter business houses in various capacities."² The appeal of the jobs that have a higher social appraisal is too great to be resisted. Possibly the women, too, feel the restiveness of modern life more acutely than do men, though probably the turnover in the case of women was always higher than in that for men.

A still more significant cause particularly affecting this industry is indicated in the statement of the Tariff Board's summary: "In the United States a considerable portion of the labor is found to be of unskilled immigrants . . . ; and in certain centers this population is of a very fluctuating kind, and the manufacturer is obliged continually to break in a new set of inexperienced operatives."³ And the Board had in mind especially the "new" immigrants, who recently have been the chief accessions from among the foreign-born. The statistical information upon which this assertion was based — though some of it statistically inconclusive, if not wholly unsatisfactory — seems to bear out the general contention. As pertinent information as any is a comparison among the several racial groups of native-born, "new" immigrants and other foreign-born, between the time spent in the industry and the time spent in the mill each representative was found in when enumerated; and a similar comparison between the time spent in the industry and that spent in the occupation which each representative was following when he was questioned. From such comparisons it appears: that of the native-

¹ *Report on Woman and Child Wage Earners*, xviii, 333.

² *Report on Schedule K*, p. 982. Another factor is the relation of the women's wages to the total earnings of their families. Often the main contribution to the latter is made by a father, husband, or brother, and the woman merely supplements the total income, working only to provide funds for a definite purpose, or at least without the same pressure that would otherwise exist to hold a job steadily.

³ *Ibid.*, p. 15.

born who had been five or more years in the industry, 70.2 per cent had been five years or more in the mill where found, and 74.6 per cent had been a similar length of time in the occupation they were then following. Corresponding figures for the foreign-born other than Italians and other "new" immigrants were 62.0 and 77.3 per cent. For the Italians and others, however, the ratios were appreciably lower: 55.9 for the first relationship, and 64.9 for the second.¹ The conclusion is obvious. When, furthermore, it is appreciated that immigrants from Italy or other countries of eastern and southeastern Europe come to our shores for the most part without previous industrial training of any sort, not to mention any prior experience in the wool manufacture, the problem of the domestic manufacturer with labor from this source with its tendency to "float" can be seen to be peculiarly difficult. The "quality" of the turnover, if I may use such a concept, is greatly worsened by the presence of these "new" immigrants.

Even on the matter of "quantity," the American wool manufacture seems to hold an unenviable position. Evidence presented by writers on labor turnover indicates that in the pre-war years the rapidity of movement in American industry as a whole was not so great as that suggested for the wool manufacture by the Tariff Board's figures above noted. Brissenden and Frankel show that for the years 1910-1913, for a number of miscellaneous industrial enterprises varying from 16 to 113 in the several years, the excess of persons hired over the average number retained in the mills was something less than 120 per cent for the four years. A separate inquiry covering eighty-four miscellaneous establishments for the year 1913-1914 revealed an excess of this sort amounting only to 93 per cent.² Whereas the wool manufacture

¹ The data are drawn from *Report on Schedule K*, pp. 971-972. Evidence on the age of women workers in American woolen and worsted mills (selected establishments) indicates that women of the new immigration do not stay long in the industry. The proportion of women twenty-five years of age and older found in mills inspected was for different racial groups as follows: American, 31.4; English, 44.4; German, 27.1; Italian, 24.1; and Polish, 10.3 (*Report on Woman and Child Wage Earners*, xviii, 334).

² Brissenden and Frankel, *Labor Turnover in Industry*, p. 36 ff. For figures comparable with those of the Tariff Board's Report, I have taken the statistics presented in this book of "accessions" in relation to the number of "full-year workers."

had possibly to handle 235 persons each year to maintain a force of 100 operatives, industries of the country as a whole had to handle 220 and perhaps as few as 190.

Yet the comparison proceeds on rather shaky limbs. Information about labor turnover either within or without the wool manufacture is too meager. Sufficient for our purposes is the probability that the flux of labor in the American wool manufacture exceeds that in many, if not that in most domestic industries, while the "quality" of the turnover in the wool-working mills is an important, additional source of difficulty. The woolen branch of the industry, by virtue of its greater geographical dispersion and the location of many establishments in smaller towns, suffers less than does the worsted branch. The former also gains because of the lower proportion of women in its working force.¹ But in either the movement of employees means increased difficulty for the manufacturer in maintenance of uniform standards in production as well as in the attainment of lower costs. The modern high turnover contrasts strangely with the settled conditions of work which one finds in the early industry, as, for example, in Humphreys's model village.

The latter is a theoretical quantity secured from dividing the total number of labor hours reported, by 3000 (evidently on the basis of 300 working days per operative of ten hours each); and it probably gives a lower base for comparison with general turnover (accessions, in this case) than does the "average number of persons employed" in the case of the Tariff Board's data relative to the "additional different persons hired during the year." Moreover, the Brissenden and Frankel figures of accessions would not exclude enumeration of persons hired more than once during the year, whereas they are definitely omitted in the Tariff Board's statistics.

Brissenden and Frankel, it may be noted, give (p. 52) a figure for turnover in the "clothing and textile manufacturing" for 1913-1914. It is a low figure (63 per cent) as compared with that for the whole group of establishments (93 per cent); but it is based on too few and too diversified enterprises to be valuable for our purposes (see their detailed data, pp. 172-177).

¹ Direct evidence upon the relative difficulties of the woolen and worsted sections is wanting, partly because the Tariff Board's *Report on Schedule K* was devoted chiefly to the worsted branch of the industry. However, it is suggestive that the proportion of women twenty-five years of age and older found in certain Maine wool-working establishments — which probably were chiefly woolen — was 52.2 of their total female force, whereas for Rhode Island, Pennsylvania, and New Jersey, where the worsted branch predominates, the like proportions were, respectively, 36.3, 29.0, and 20.3 (*Report on Woman and Child Wage Earners*, xviii, 333).

Present-day manufacturers, to be sure, have not rested supinely in the face of this difficulty. More extensively than foreign manufacturers American concerns have proceeded upon programs of welfare work, adopted of course not wholly out of consideration for this end, but apparently not without hope that such welfare features would aid in mitigating the movement of operatives from mill to mill and from the wool manufacture to other occupations. A few concerns have instituted some means of allowing employees to share directly or indirectly in the prosperity of the enterprise with which they are connected, as through the payment of dividends upon wages equivalent to that upon stock, — a scheme which the Farr Alpaca Company follows, — or by the sale of stock shares at prices advantageous to the operative. Other enterprises have provided rest rooms in the mill, lunch rooms conducted at cost, athletic facilities, and the like. What the net result upon labor turnover has been, is problematical, and probably could not be ascertained. Competitive action along this line among several mills in a given community might even be harmful with respect to movement between mills, although perhaps other objects in welfare work, such as the combat of trade-union influence, might be served. At least, this relatively new phenomenon in industrial policy is noteworthy, and it is important to note the background of this policy in labor conditions within the manufacture.¹

4. Labor Organization.

The effect of the conditions already outlined with respect to labor is perhaps nowhere clearer than in the field of labor organization. The trade-union movement has found the wool manufacture a hard ground to cultivate. To be sure, there has arisen a body called the United Textile Workers, which has affiliated with the American Federation of Labor; but it is a

¹ The concern which has gone furthest in welfare work, at least in recent years, is the American Woolen Company. Of this development something will be said when that combination is discussed. It is interesting to note now that in the Company's Shawsheen project there is something of an attempted resuscitation of the conditions which obtained in the early domestic manufacture, — in some measure, a return to the model community of Humphreys's creation.

rather anomalous affair, with membership drawn from all branches of the textile trades. Technically speaking, it is an amalgamation of related "trade" unions, each of a local rather than of a regional or national character. The workers in a given occupation within a certain area — loom-fixers, spinners, dyers, and the like in Lawrence or Woonsocket — are united into a special and distinct union, which later is admitted to membership in the larger organization of the United Textile Workers. For an industry with as marked variations in skill among the several occupations, and with some separation of occupations along lines of sex, possibly this is as good a method of organization as could be devised. However, whatever its inherent virtues, it has never been able to unionize the wool manufacture with any degree of completeness; and its formal strength in the industry seemingly is not great at present.¹ Possibly the shift in sex groups of the workers has interfered in a minor way with the development of organization. Unquestionably, the introduction of the "new" immigrants, their brief sojourns in a given occupation, and their continued replacement by recent arrivals from abroad would in any industry place obstacles in the way of trade-union development.

It is not without significance that the loom-fixers form one of the groups within the industry that have been well organized. These are all men; they are skilled mechanics (they have the duty of maintaining the weaving machines in good repair); they are predominantly persons born in this country or of north-European stock; and they probably have a low labor turnover.² Such operatives form a group of sufficient intelligence, homogeneity, and stability to permit a considerable measure of unity.

¹ Data upon this phase of the wool manufacture are very meager. Published information tells little, and inquiries at the offices of the Union give small results. Largely, the difficulty arises from the confusion of the several textile trades within the same organization. The cotton industry has also overshadowed the wool in this matter.

² According to the *Report on Schedule K* (p. 956), loom-fixers were all men; and of them, 45.3 per cent were native-born, 48.5 per cent were from countries other than Italy and southeastern Europe, and only 6.2 per cent were of the latter sort.

At least in the Philadelphia district, the warp-dressers, another vocation demanding considerable skill, has also been well organized.

Weavers, seemingly, also contribute well toward the membership of the United Textile Workers; and they share somewhat in the characteristics of the loom-fixers. Outside of such groups the continued allegiance and coöperation in organized unions do not make much progress among the operatives in woolen and worsted mills. However, it should be noted that the conditions of the times have much effect. During the World War, when unions were successful (without great effort) in getting wage advances and shorter hours for textile workers, and when the attitude of the government was favorable, they grew in strength. Possibly the Textile Workers have been able to retain some share of this enhanced membership, but the industry is still far from well organized.

Despite this lack of thoroughness in organization, the unions have been able to exercise considerable influence. They have brought pressure to bear for the attainment of better working conditions; and they have taken up much of the slack in the matter of wages, at least for their own members. There even are cases, such as that of the wool-sorters in the Boston sheds, where they have succeeded in imposing something like a "stint" or maximum of work per period of time. Of course there exists no objective standard by which success of the unions may be measured; but, as one examines the fragmentary evidence and talks with manufacturers, he secures the impression that I have already indicated: that the influence of the unions has not been inconsiderable. Then the question naturally arises, why so? What are the reasons for such an influence despite incomplete unionization? In reply, one would find an important factor that of wise leadership. Under the direction of Mr. John Golden, the late president, the Textile Workers applied pressure when conditions beyond their control were favorable to their success. Such, for example, was the strategy by which the forty-eight-hour week was secured in 1919-1920. During the post-war boom, manufacturers were not in a position, nor were they disposed, to contest the matter. And once secured, an advance may be defended even with somewhat depleted ranks. Yet, perhaps, in larger part than by reason of good strategy, the influence of the unions has been

increased by the tendency for the non-union workers to follow their union fellows. This was the lesson of the Lawrence strike in 1912. Temporarily, during the time of action, the union will exert greater force than an inspection of its membership roll would suggest. Possibly a third factor has not been without effect. Students of labor matters have observed that labor organizations in the more skilled and smaller sections of an industry have a special aid in making their efforts fruitful, since increases in wages to them do not mean a general increase of wages in the industry. The larger proportion of unorganized workers cannot take effective action. This formula, obviously, seems to fit the domestic wool manufacture, with its restricted body of organized workers, and those workers largely of the skilled occupations.

The effectiveness of the unions in the past, however, has been curtailed in some degree by dissension within the ranks, — another feature which may be traced in part to the immigrant contingent among the operatives. To the more orderly body of United Textile Workers has been opposed the radical Industrial Workers of the World. The latter organization first came to the front in the above-mentioned Lawrence strike. It was an organization upon a markedly different plan from the older one, being a so-called "industrial" union. All operatives, men or women, skilled or unskilled, were enrolled in the "one big" union. And the leaders and membership in this new body differed appreciably from the United Textile Workers. The leaders were largely foreigners or men of foreign extraction: such men as Ettor and Giovanitti; and they drew largely upon the foreign-born operatives for their power. While the strength of this organization waned after the strike, the I. W. W. has not disappeared, and it still contests the field with the United Textile Workers. Whether in the future the industrial or the trade-union form of organization will prevail cannot well be guessed. At present the trade-union organization has the upper hand.

5. *Course of Wages.*

A final consideration in connection with labor is the general movement of wages during the period since 1870, — the only

period for which there exist data of even approximate accuracy. In so far, to be sure, as the course of wages in the wool manufacture merely reflects changes in the purchasing power of money, we are not specially concerned. But there are features of the movement peculiar to the wool manufacture, and these are germane to the present discussion.

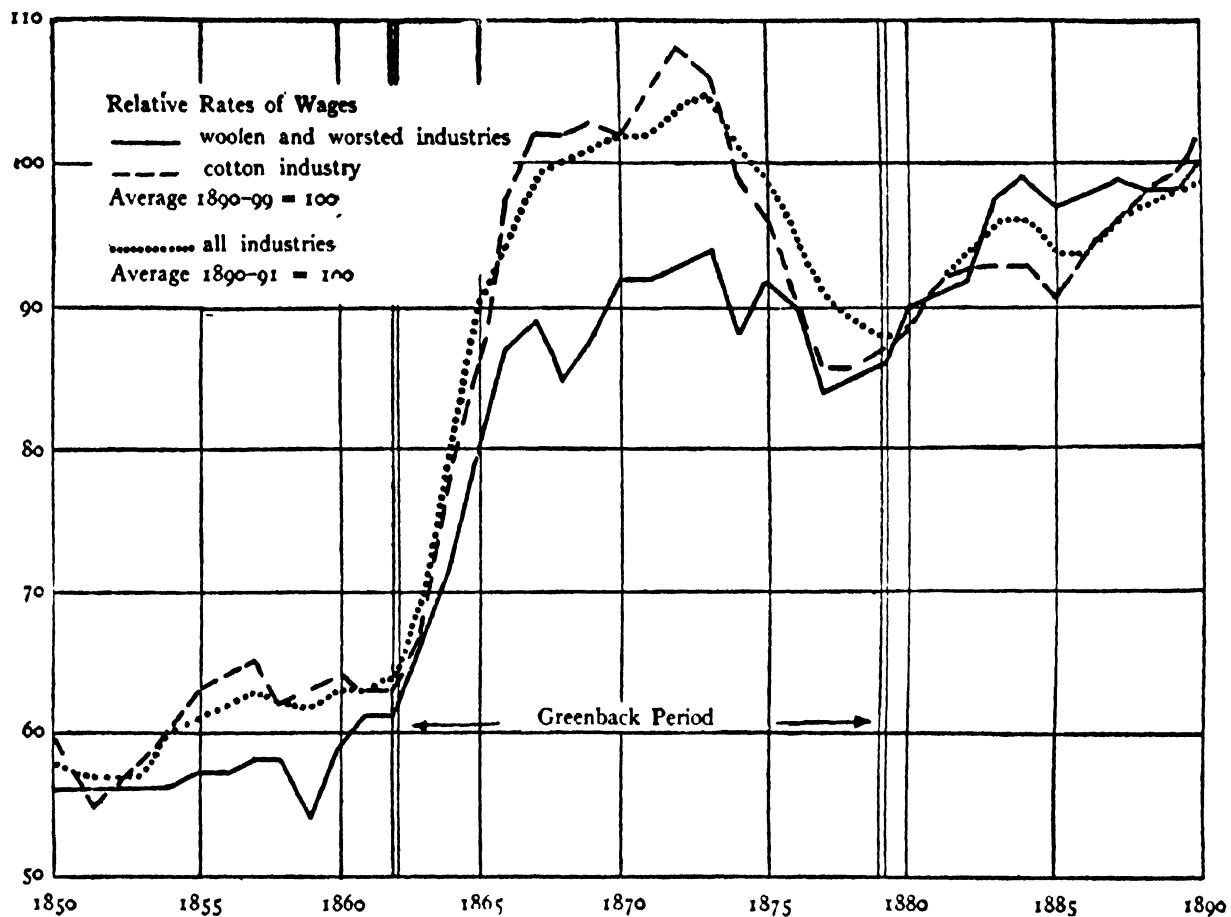


FIG. 18. Comparison of the Movement of Wages in the Wool Manufacture, Cotton Manufacture, and All Industries, 1850-1890.

In the graphs here presented (Figures 18 and 19),¹ which indicate the course of wages in the wool-manufacturing industry as compared with that over a similar period in the cotton-goods manufacture, and, through 1891, in all industries, several peculiarities with respect to the former are apparent. In the fifties the curve representative of wages in the wool manufacture reflected the relative depression in that industry that prevailed during that decade. During the Civil War, however, wages in

¹ The data for these charts were obtained from the Aldrich *Report on Wholesale Prices and Wages*, Pt. I, pp. 173-174, and from various reports of the Bureau of Labor Statistics. The figures given in the Aldrich Report were originally on the base of 1860, but by use of the years 1890-1891 as a turning point — figures for these years being available in both statistical series — the Aldrich data have been converted to the basis of 1890-1899 = 100.

this manufacture rose with approximately the same rapidity that they did in the cotton manufacture, and, indeed, with nearly the same speed that wages in all industries advanced. If the level of wages in 1860 be taken as the base for the sev-

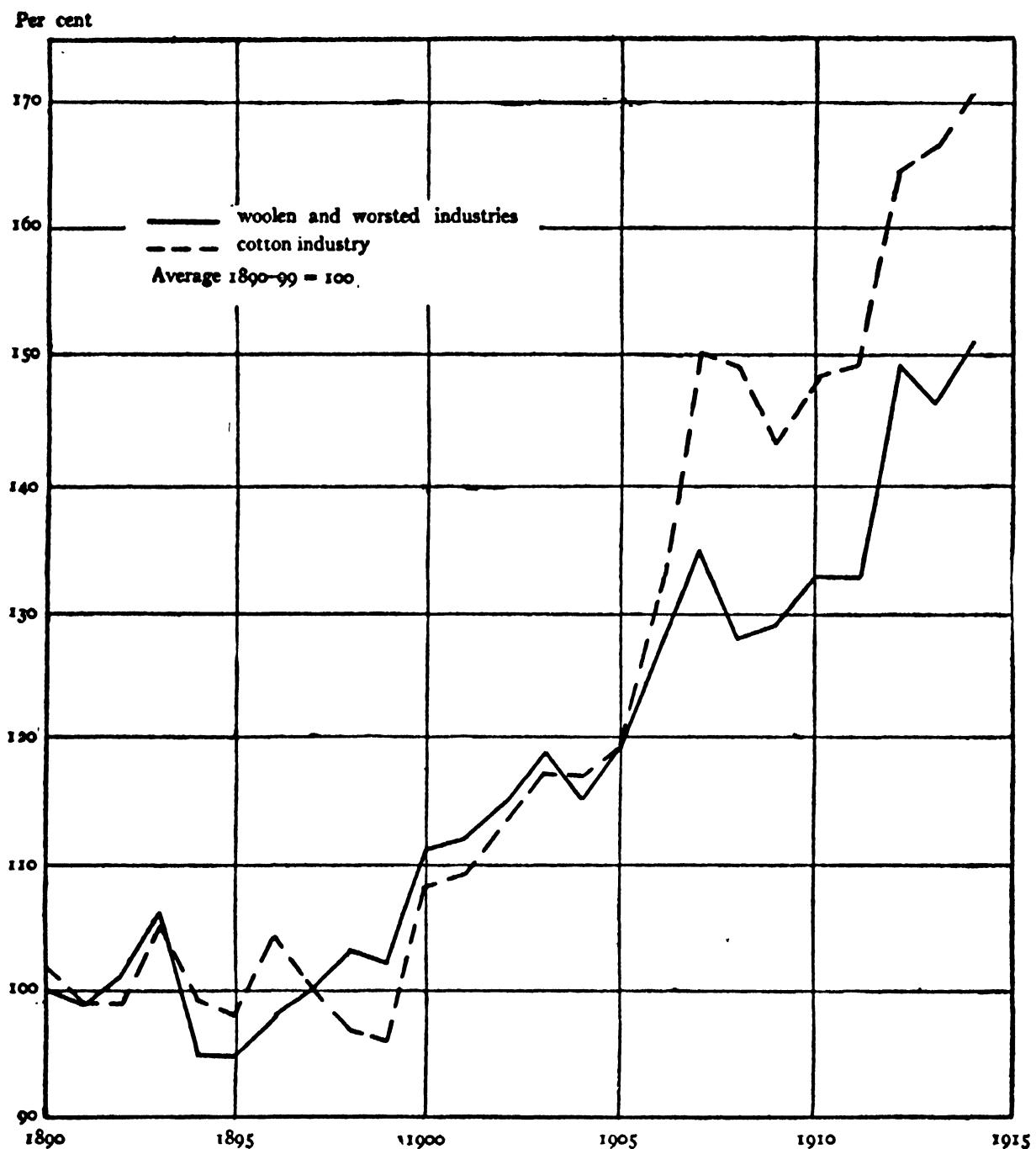


FIG. 19. Movement of Wages in Wool and Cotton Manufactures, 1890-1914.

eral cases, wages in the wool manufacture had reached 137 by 1865, those in the cotton industry 134, and those in all industries 143.

Subsequent to the close of the war, rates of wages in wool-manufacturing seem to have shown much less buoyancy than in the manufacture of cotton, or in industrial lines generally. The curve for the wool manufacture moves to a peak in 1873, but at

no such extreme height as in the other cases.¹ Probably this indicates the comparative over-extension of the former during the war and mirrors the readjustments which were necessary during the post-war years. But if the movement in wool-manufacturing was heavy prior to 1873, so was the reaction less considerable. The manufacture of wool was increasing in strength during this period, especially with the addition of the worsted-coating section and with the completion of post-war readjustment; and the course of wages indicates the attainment of such new conditions.

After the resumption of specie payments in 1879, the movement of wage rates in the industry suggests no differences in affairs within that manufacture from those which obtained in the cotton industry, — one of the most prosperous manufactures of the period, — or, as far as one can ascertain, from those which obtained in other lines of production. The years under the tariff of 1883 seemingly were a period of less rapid advance than the years immediately before or after, the course of wages being relatively flat until 1890. At the same time wage rates in the cotton industry and in "all industries" were rising rather markedly. This feature of the wool manufacture corresponds with what we would expect from a consideration of other evidence. Business was not really bad during the years of this tariff, but the industry was not so well protected and was not so free to expand as it had been in 1867-1883 and as it was to be under the McKinley and Dingley acts. Again, the combination of lower duties and general industrial depression during 1894-1897 sent rates of wages in the wool manufacture somewhat lower than in other lines. That these rates did not fall even lower is indicative of the brevity of really difficult conditions under the tariff of 1894. Wages had begun to lift already by 1896. Thirdly, it is noteworthy that in the years after 1905 the rise of wages in the wool manufacture was less rapid than that in the kindred cotton industry. Explanation here seems to lie in the rapid influx of immigrant labor into the former

¹ In 1873, the average rate of wages in the cotton manufacture had reached 167.2 (on the base of 1860 = 100), that for all industries 167.1, and that for the wool workers only 158.2.

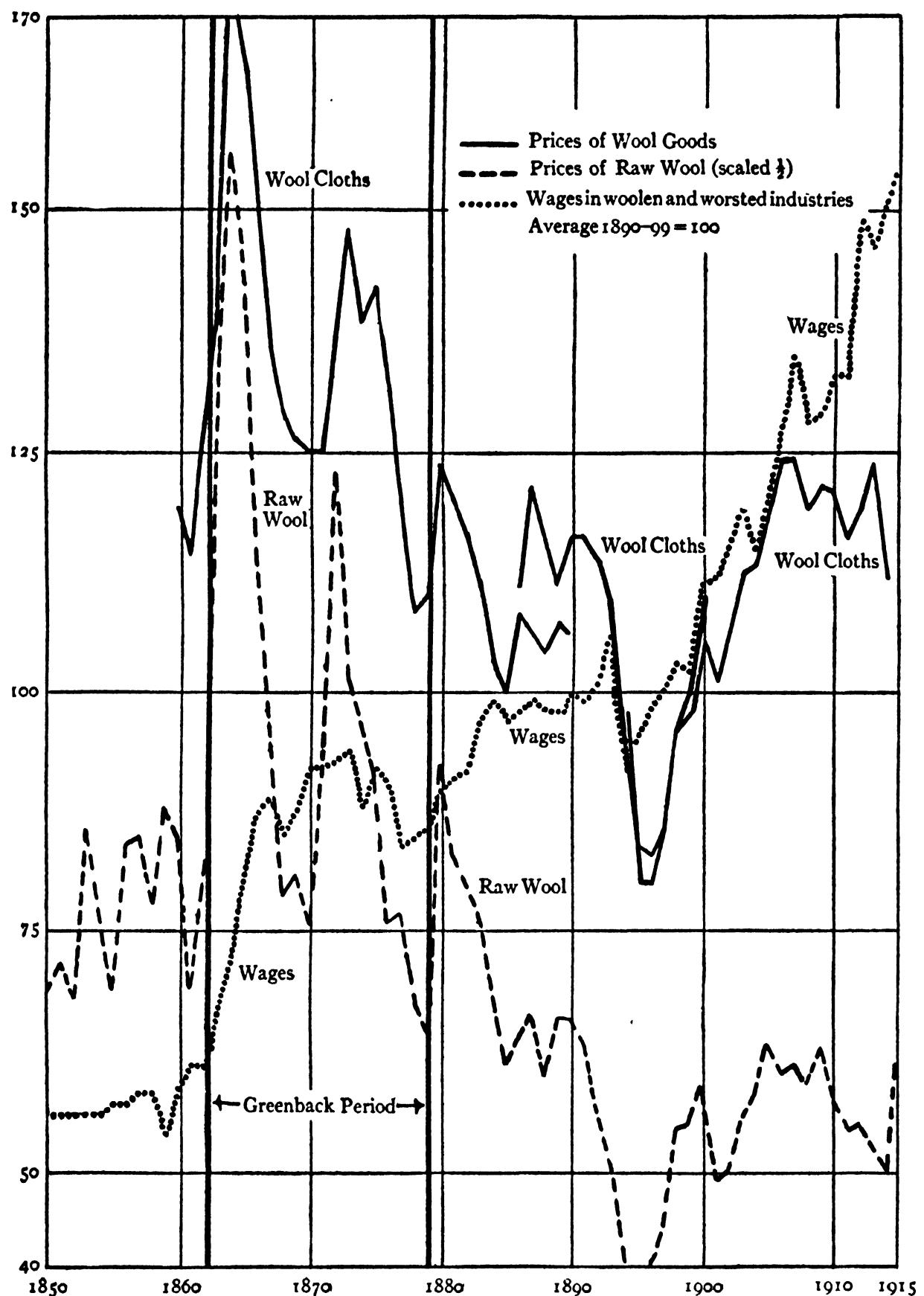


FIG. 20. Comparison of the Movement of the Prices of Raw Wool and Wool Goods, and of Wages in the Wool Manufacture, 1850-1915.

manufacture during these years, and in the less considerable strength of trade-unions in the wool as compared with those in the cotton industry.

But this movement in wage rates, significant and important in itself, must be tied up with the trend of other factors in the in-

dustry, especially the price of wool, the price of wool products, and the value added by manufacture (the value of products minus the cost of materials). As appears in the accompanying graph (Figure 20) on which the movements of wages, wool prices, and prices of wool manufactures are compared, the trend of wages has been more persistently upward than that of the other items. In good times wages have shared in the up-swing, while in bad times they have receded less considerably. Between 1865 and 1895 the trend in the case of wages was directly opposite that of prices for wool or wool goods.¹ Yet the industry as a whole has prospered during the period since 1870. Particularly has the worsted branch been successfully carried on, expanding its scope and extending the variety of its production. And probably not unrelated to this experience of the worsted manufacture is the generally decreasing ratio of the wages bill to the total value added by manufacture in that end of the industry. This decrease is evident in the following tabulation where the statistics for the worsted and woolen branches are compared:

RATIO OF WAGES PAID TO VALUE ADDED BY MANUFACTURE

	1869	1879	1889	1899	1904	1909	1914	1919
Worsted Manufacture . .	56.1	49.3	52.5	46.5	46.8	44.9	55.7	40.1
Woolen Manufacture . .	45.6	43.2	50.9	52.2	53.0	54.4	60.3	45.3

If we ignore for the moment the last two figures in each case, — since they present certain peculiarities, — we find that the proportion of wages to value added by manufacture in the worsted branch declined between 1869 and 1909 from 56.1 to 44.9 per

¹ The curves of wool prices and of fabric prices are not wholly satisfactory from a statistical point of view. The curve for the former is based on two series, of the Aldrich Report and of the Bureau of Labor Statistics, for Ohio scoured wools covering the whole period 1860-1914. The average of prices for the years 1890-1899 is employed as 100.

The curve for the prices of wool products is constructed from the following price series found in the Aldrich Report and continued by the reports on wholesale prices made by the Bureau of Labor Statistics: Broadcloth, first quality (1860-1914); suiting, Middlesex (1869-1914); dress-goods, cashmere (1880-1904); worsted yarn (1872-1914); blanket, cotton-warp (1860-1901); horse-blanket (1860-1914). The average price for the years 1890-1899 is again used as the base. Where series are added or dropped, the curves with the new and old groups of series are made to overlap.

cent, whereas the similar proportion in the woolen end rose from 45.6 to 54.4 per cent. Such difference in trend is wholly in accord with what would be expected from the relative advance of the two branches in size of producing unit, in standardization of output, in utilization of labor-saving machinery, and the like. The course of wages presumably was in some measure dictated by the more effective worsted manufacture, even as command over the raw material lies largely in the hands of that industry; and the woolen branch was unable to absorb such increased wage rates through improved operation.¹

Conclusion.

Changes in the character of the laboring force and in the conditions surrounding that force have been more considerable in the decades since 1870 than during any previous period. Composition of the working staff, the length of the working day, and the voluntary organization of the operatives have all been affected. Moreover, in the wool manufacture as in most other lines of production, the labor side of the industry has come in recent years to play a more important rôle than ever before.

Particularly noteworthy are the changes in proportions of men, women, and children in the wool-cloth production which have occurred since 1870. Child labor has been diminished, especially in the woolen branch. On the other hand, the proportion of adult males has increased appreciably. In part this last feature is the result of more abundant supply of such laborers caused by enhanced immigration; but since the trend had begun before immigrant help had come to form an important part of the working force, not all the change may be laid to that cause. Modification of machinery and methods has been in part responsible.

¹ The increase of ratio for both series in 1914 is to be explained by the marked increase in wage rates during this period (see Fig. 20, above) when prices of wool fabrics were tending downwards with the price of wool. The decline in price of wool fabrics would diminish the absolute amount of value added by manufacture; and the ratio of the enhanced wages bill to the value added by manufacture would be increased. The sharp drop in ratio for the year 1919 may in considerable part be attributed to the failure at that time of wages to rise as rapidly as did raw material and so indirectly the value added by manufacture.

The high and increasing proportion of adult male employees in the woolen branch of the industry should be taken into account in assessing its comparative effectiveness. Unless the use of such labor is compensated by a greater productivity on its part, the woolen manufacture would suffer in competition with other manufactures employing a smaller percentage of such higher paid help. Perhaps this factor is in part responsible for the capture by these other industries of portions of the field once held exclusively by the woolen manufacture: inroads of the cotton industry into the supply of blankets and flannel, introduction of jersey cloth and other knitted goods from the knit-goods production, and competition of the worsted manufacture all along the line. On the other hand, the worsted industry itself may have suffered somewhat by incursions into its original province from the knit-goods and silk manufactures which have a lower proportion of adult male workers than has that industry.

The invasion of the wool manufacture generally by immigrant labor, complicated by the peculiar restlessness of such labor, has not added strength to the industry. To be sure, the production of wool fabrics has not *ipso facto* been subjected to enhanced competition from the other textile industries such as that just noted, since these other manufactures have been affected in greater or less degree by the same influence. However, the productive capacity of the wool-cloth manufacture has undoubtedly been lowered, and in relation to foreign importations this situation is of considerable importance.

On a somewhat similar basis, the shortening of working hours is of significance. The earlier reduction in length of working day — from "sunrise to sunset" to a day of more reasonable length — may well have resulted in an actual increase in productivity; but the cut from ten to eight hours of working time probably caused a real diminution in output, — especially as there has been much less opportunity of counteracting this step through the introduction of improved machinery or of other economies in effort.¹

¹ That there is room for further economies and greater efficiency in wool-manufacturing establishments, as well as in other textile mills, cannot be denied. The reader is referred to the report of the Federated American Engineering Societies —

Inasmuch as the general trend both here and abroad has been toward the adoption of an eight-hour day, the direct effect of its adoption in the domestic wool manufacture is less from a competitive viewpoint. If other nations, as for example the Continental countries, should not be able to hold firmly to this program, the consequences of the recent step in curtailment of hours may come home sensibly to American manufacturers and employees.

Finally, the relation between the condition of the workers in the industry and the extent of trade-union organization is noteworthy. The shortening of the working day has been outlined above, as well as the inauguration and extension of welfare work directed toward ameliorating the circumstances of the workers' lives. To these might be added the rise of wages corresponding generally with the rise in other occupations, — a movement that has proceeded sometimes contrary to, sometimes more rapidly upward than, the price of wool or wool manufactures, — the reduction of hazards to life and limb of the operative through better factory laws, the elimination of the "truck" system of payment, and the like. Yet these have been secured without any effective labor-union organization or influence. The unions have as yet played little part in directing the course of the industry, and the tremendous gains which have inured to the workers have been chiefly the result of other causes, — competition with other industries for operatives, enlightened social pressure or legislation, and the willingness of employers to move with the times. Incidentally, it is notable that the partial unionization of the industry is one of the few features in the general situation, which indicates immaturity in the manufacture and the likelihood of change in the near future. The reasons for this incomplete development, like the causes of general advance in the condition of the workers,

Waste in Industry — although this report has been criticized by men in the wool manufacture as unfair in so far as it relates to their industry, since it fails to appreciate the technical obstacles involved in many situations. But it is equally apparent that improvement is increasingly difficult, calling for a higher degree of managerial ability or heavier expenditure of capital, and that the returns on such effort and investment become less and less as advance proceeds.

lie chiefly outside the industry itself, and principally in the youthfulness and immaturity of the whole labor-union movement in the United States. Probably as the general movement progresses, we may expect within the wool manufacture the attainment of more complete unionization, though seemingly many years must elapse before the situation in the domestic industry will reach the advanced development shown by the labor conditions in the British wool manufacture.¹

¹ Cf. United States Tariff Commission, *A Survey of the British Wool-Manufacturing Industry*, 1920, pp. 51, 54, 97-98.

CHAPTER XXVII

CHANGES IN DISTRIBUTIVE AGENCIES

PERHAPS no more striking changes have come to the wool manufacture in the period since 1870 than on the side of the marketing of its products. To the historian of commercial development the story is an absorbing one, — the breakdown of the old system of distribution over a considerable area of the trade in wool fabrics, and the development of new arrangements better fitted to modern economic conditions. But not all of these phases can be elaborated here. We are interested primarily to ascertain only those modifications in the commercial organization that have affected in an appreciable degree the methods, quality, or volume of the wool manufacture itself. Accordingly, while an attempt will be made to put the various changes in their proper setting of commercial development, and especially of the development already sketched for earlier periods, the greater emphasis will be placed upon those features which do bear most closely upon the manufacturing side.

With the opening up of the West had gone the expansion of the distributive system to take care of this new territory; and this expansion had taken the form of additional wholesale and jobbing houses located in the growing western and southwestern cities. To them sold the eastern wholesale merchants, chiefly located in New York, these in turn purchasing from the commission merchants acting for the mills. But soon breaks began to appear in this orderly system. Already comment has been made of the modification introduced when the wholesale clothing industry began to grow.¹ Now came a series of somewhat similar occurrences. First, we should note "the adoption of better merchandising methods on the part of manufacturers and commission houses." In the eighties, it is reported, the manufacturers

¹ See above, Vol. I. pp. 292-296.

(or probably the commission merchants for them) "learned the advantage of selling by sample on the road, and by their traveling salesmen solicited the custom of the whole country."¹ In short, the manufacturer's factor was jumping the head of the wholesalers, and selling directly to the jobbing concerns wherever they might be located. The manufacturer was thereby getting into more direct touch with the consumer. However, quite as significant for us is the mere fact that trading could be done on the basis of samples. That marks an advance in commercial practice favorable to large-scale operation; and it indicates a higher standard of business ethics in the industry.

But not content with disregarding the New York merchants, the commission agents of the mills, and apparently sometimes the manufacturers themselves, began to sell (or to sell more largely than before) over the heads of the whole group of cloth distributors. Their customers in such operations were large purchasers, for whose trade the agents or mills could afford to alienate the "regular" organization; and specifically they were of two sorts, the wholesale clothing manufacturers — the "cutting-up trade" — and the large department stores. The sale to clothing manufacturers, of course, was no new phenomenon of this period. The early development of this particular merchandising method has been sketched up to the point where, as the *Census of 1860* had said, the distribution of cloth had in a noteworthy measure fallen "into the hands of wholesale clothing merchants, who thus unite the jobbing business with that of manufacturers and dealers in clothing on a large scale."² But the subsequent change in the situation was startling. The increase both in volume and diversity of this trade after 1870 produced a somewhat novel situation, almost a difference in kind instead of merely in degree. The wholesale clothing industry in 1870, as already noted, was still confined to the production of men's apparel, and even in that field was just beginning its real

¹ Edward D. Page, "Lessons of the Claflin Crash," *Independent*, July 13, 1914, p. 76. H. B. Claflin & Company of New York had been one of the few surviving large operators in dry-goods distributing in that center. They were described as a "general dry-goods jobbing house."

² *Census of 1860*, iii, p. lxiv.

expansion. The growth in that branch since 1870 has been extraordinary. In the number of employees, to be sure, the increase has been only about 75 per cent; but in "value added by manufacture," i. e., the excess of the value of the product over the cost of materials, the enhancement has been more than nine-fold. Indeed, on the basis either of the present number of wage-earners or of value added by the manufacturing operations, this section of the clothing industry alone overtops the combined woolen and worsted-cloth manufactures.¹

On the whole, however, as far as the production of men's wool clothing is concerned,² the growth has been largely in volume alone. Overcoats, suits, mackinaws, and the like were produced in 1870; and the only important changes have been the sharper distinction of the light-weight and heavy-weight seasons and the addition of such goods as raincoats, dress clothes, and light summer suitings. Change in quality of output there has been, to be sure. The wholesale manufacture of men's-wear garments had begun predominantly at the lower level of quality. Indeed, as late as 1879, when Mr. John L. Hayes was chronicling the substantial disappearance of the jobber "through the large sale of goods directly to the most important consumers, the clothing manufacturers," he confines his remarks to the trade in "medium and low goods."³ More recently, attention of the wholesale

¹ The growth in the production of both men's and women's clothing may be gathered from the following tabulation, showing the number of wage-earners and the value added by manufacture in the two branches at the several Census dates:

MEN'S CLOTHING			WOMEN'S CLOTHING		
	Number of Wage Earners	Value Added by Manufacture		Number of Wage Earners	Value Added by Manufacture
1869	108,128	\$61,533,000		11,696	\$6,063,000
1879	160,813	78,185,000		25,192	12,446,000
1889	144,926	122,173,000		39,149	33,887,000
1899	120,956	131,566,000		83,739	74,635,000
1909	191,183	233,155,000		153,743	175,963,000
1919	175,270	557,233,000		165,649	528,136,000

² The Census includes under men's clothing, not only wool fabrics but overalls, market frocks, uniforms, bathing suits, gymnasium and sporting clothes, and the like. Articles of greater importance in men's wear, such as shirts, collars and cuffs, and furnishing goods, are excluded. Accordingly, in the figures of "men's clothing," men's outer garments of wool are the predominant element.

³ *Bulletin*, 1879, p. 281.

clothiers has turned in a greater measure to the production of medium and finer garments. While still interested primarily in cloth procurable upon a price rather than upon a quality basis, they have not hesitated to handle for a portion of their business fabrics of the better American manufacture and at times high-grade goods secured in the foreign market.¹

The consequences of this change in quality of output in the wholesale clothing industry have been at least two-fold. One has been the serious inroad upon the province of the custom tailor, even as earlier factory-made fabrics overran steadily the field of the household cloth producer. The place of the custom tailor in the supply of men's wool clothing is much smaller now than it was in 1870; and, of course, this situation has had reaction upon the volume of production in the wholesale clothing trade. Secondly, in so far as the change in quality of clothing manufacture has been toward the production of medium-grade goods which possessed a semi-standardized character — medium-grade serge suits and the like — this factor has had an important influence upon the scale of operation in the cloth-producing industry. Aiding in this same direction has been the consolidation and growth of individual garment-making concerns until that manufacture embraced a number of large-sized enterprises. By virtue of these conditions in the clothing end, the cloth mills have found it advantageous to expand their operations toward units of larger proportions. And thus the organization of the clothing industry has gone in part to encourage that force derived from the breadth of the American market and the development of standardized fabrics, which has tended to bring a larger scale of individual establishment in the domestic wool manufacture.

On the other hand, the enlargement of the production in women's-wear garments, proportionately greater in fact than that in men's clothing, has been accompanied by more marked changes in type and quality of output. In 1870 cotton goods — women's house dresses, aprons, and the like — composed the

¹ Larger clothiers such as Hart, Schaffner & Marx and Kuppenheimer & Company have at times maintained offices in such foreign wool-cloth centers as Huddersfield, England.

entire production in women's ready-made garments. Then in the seventies came the addition of women's wool cloaks, — "cloaks, dolmans, jackets, talmas, ulsters, and other outside garments."¹ Women's ready-made suits were introduced only in the eighties; but the growth of the industry has been rapid since that time. By 1909, not only had the manufacture increased six-fold over its condition in 1879, — measured even by the number of employees,² — but the whole modern range of wool products, including especially coats and suits, was being turned out in volume.³ Nor should one neglect the fact that commencing with medium and low-grade goods, the manufacture has gradually taken up the production of articles adapted to the highest feminine trade as well as articles made from the finest dress fabrics. The trade in dresses, coats, and suits for women's wear has overrun the possible field for such goods in a degree substantially greater than that in garments of similar quality for men's wear. Rarely nowadays are women's wool garments custom-made, either by tailors or by dressmakers. The department store and the specialized cloak-and-suit shops have captured nearly the entire area of women's needs.⁴ Such a revolution as this in the garment trade inevitably had consequences in the cloth-distributing field. Indeed, the manner of selling fabrics for women's wear, particularly dress-goods, has been largely overturned in the past half-century. The mills producing these lighter fabrics have found it advantageous to set up more direct connections with the clothing manufacturers, while less and less of their output has continued in the older channel of trade through the jobbing houses.⁵

¹ *Bulletin*, 1886, p. 63.

² Measured by the value added by manufacture, the industry had also increased six-fold between 1880 and 1900.

³ *Census of Manufactures*, 1914, ii, 187.

⁴ The large-scale organization of this manufacture of women's wool garments has also led to the purchase of more goods per capita than might possibly otherwise have been the case, through the stimulation of demand by means of frequent style changes widely advertised. Of course the economic basis of a large purchasing power had to exist before such artifices could bring important results.

⁵ For example, note the experience of the Arlington Mills: *A Brief Outline of the Business of William Whitman and Company*, 1910, pp. 26-27.

Accordingly, the market in the clothing trade for the products of the domestic wool manufacture has become ever more important to the latter, and may indeed be said to dominate the American trade at the present time. Situated in the East, except for the development of men's clothing production in the Cleveland and Chicago areas, the wholesale clothing industry has kept in intimate touch with the wool manufacture, influencing in an important manner the conduct and character of the latter. Various points at which this relationship has had effect have already appeared. Others will be noted from time to time in the subsequent discussion. At present, we can confine attention to the side of merchandising and commercial organization.

The establishment of the new regime in cloth distribution has, in fact, had at least one important effect upon the method of sale, the more restricted matter of actual merchandising. The rise of the wholesale clothing industry has apparently been responsible for cloaking with new significance a selling method, seasonal "openings," which had developed during the preceding decades for the convenience of the jobbing interest. Many commission merchants and other selling agencies of the mills, timing their action to suit the needs of the jobbers, had come to make a fairly formal presentation of their lines for the season, at the same time announcing the prices for the goods. Now the "openings" became more general in the trade, as large-scale buying encouraged the adoption of large-scale selling methods; more definite periods came to be recognized for the winter and summer displays; while the whole market for cloths — and indirectly that for raw materials — came to turn upon the regular exhibitions by these distributing merchants and manufacturers. As may well be imagined, the openings of the larger operators in the wool manufacture attracted the most attention, and more recently none has been so eagerly awaited as that of the American Woolen

Incidentally, we may note that the greater sale to wholesale clothiers has altered the normal width in dress-goods. Formerly manufactured in narrow widths, mostly twenty-seven to forty-two inches wide, they have come now to be produced largely at a uniform width of fifty-four inches, since such a width is most suitable to the cutting-up trade. This alteration has in turn caused a change in the width of loom.

Company.¹ The influence of openings all along, then, has been toward greater ease in large-scale marketing, toward keener competition among manufacturers, and yet toward greater stability in the industry.

The process of circumventing the dry-goods middlemen, however, was two-fold; and there remains yet to consider the direct sales to large retailers, i. e., the large department stores. Just when this change first appeared is quite uncertain. It is one of those gradual shifts in commercial practice that seem to have no beginning and to leave no lasting mark of their progress. Apparently, no appreciable alteration had occurred prior to 1870. Thereafter, with the increasing population of the country and with a growing urban concentration, came the evolution of the mammoth retailing establishments which became known as department stores.² They grew in number and they grew in size, until by 1914 it could be said that "the aggregate volume of sales in any one of the large department stores is larger than that of any jobbing house outside of the cities of New York, Chicago, and St. Louis."³ Their selling power early attracted attention, and it became profitable for both the store and the mill's selling agent to get into closer contact. "Mills and commission houses," said the writer just quoted, "have been keen to see the advantage of selling direct to these great retailers. Many of them have even come to break packages and sell by the piece; and as a consequence, in the main, the department stores are quite independent of the jobber."⁴ Thus, in the realm of piece-goods, — the fabrics sold in the piece to the customer for his or her own fabrication into garments, or perhaps fabrication under his or her immediate direction, — the mill moved closer to the final consumer for a substantial portion of its business. This step perhaps has not conferred the benefits to the cloth manufacturer that flowed from direct contact with the wholesale clothier. The volume of

¹ See below, pp. 236-237.

² Claims are, to be sure, made of department stores established as far back as 1858; but on the whole, says Cherington writing in 1916, "the department store is mainly a development of the past forty years" (*The Wool Industry*, pp. 224-225).

³ Edward D. Page, in *Independent*, 1914, lxxix, p. 77.

⁴ *Ibid.*, p. 77.

sales is not so large; and some of the possible benefit is counterbalanced by the fact that the department store desirous of catching the final word in the season's styles tends to delay its purchases immoderately and then to expect immediate deliveries. Yet for the staple goods this change of practice has meant a cheapening of distributive costs; and it has sometimes given an opportunity for the successful manufacturer to secure a hold upon the consumer, when the retailer has coöperated in "playing-up" the mill's products.¹

One more change in the distributive system remains to be noted. Previous discussion has indicated the early utilization of several commission houses by cloth manufacturers in the sale of their products. Such was the action of the Slater mills in the period of the twenties. Later it became the practice for manufacturers to sell wholly through one merchant, a "selling agent," though perhaps the latter might have branch houses in one or more cities.² Now comes a further step, the adoption of direct selling by the mill. Isolated cases of this sort had occurred in the past. For example, the products of the Middlesex Mills, after the reorganization which followed upon the crisis of 1857, were sold by the treasurer of the company; though it is uncertain how long this practice continued.³ In the latter decades of the nineteenth century, however, the movement became more general, and apparently continued through the first part of the new century. "In the evolution of later years," wrote an observer in 1895, "the tendency has been steadily toward the independence of the producer in the direction of the selling of his own goods."⁴ And Mr. John P. Wood, speaking in 1913, said that "the tendency has been in the last twenty years for more and more of the mills to sell their goods directly."⁵ To "the harsh experiences

¹ For a fuller discussion of the department store and its functions in relation to wool products, see Cherington, *The Wool Industry*, ch. xv.

² See above, Vol. I, p. 291.

³ See above, Vol. I, p. 290.

⁴ *Bulletin*, 1895, p. 62.

⁵ *Tariff Hearings*, 1913, iv, 4165. See also Warburg, *Wool and Wool Manufacture*, 1920, p. 45: commercial paper of a cotton mill usually bears the endorsement of its commission house; that of a woolen or worsted mill does not. "The reason for this is that a large number of the wool manufacturing establishments sell direct to wholesalers and jobbers, and have no close affiliations with a selling-house."

of manufacturers in times of commercial crises," this tendency is attributed by the former of these gentlemen; but seemingly the cause lies much deeper. Perhaps one of the reasons for "harsh experiences" on the part of the manufacturers, and surely the chief cause in this particular development, has been the increasing size of the business unit in the wool manufacture. As the individual enterprise expanded, and as the manufacturing end, especially of staple goods, became relatively standardized, the interest of the managers argued for adding the profits of distribution to those of production alone. And the stabilization of technique and organization in the manufacturing side gave an opportunity to the company chiefs to make this advance. However, the distinction should be made clear, that whereas other changes on the commercial side gave an impetus, and in a way contributed, to the development of large-scale business, this direct selling by the mills was largely a result of the latter development.

In conclusion, the question arises: What remains of the old system? From the viewpoint of manufacturing, may it now be ignored? The answer must surely be in the negative. The newer methods of distribution dominate the present situation, but the older ones are not yet negligible. The wholesale merchants, to be sure, have largely disappeared. A few exist, but they are located chiefly in the West. Probably by 1895-1900 this form of commercial house had ceased to have a significant rôle in the distribution of domestic fabrics.¹ But the jobbers, scattered through the country and possessing influence of varying scope, continue to be an essential cog in the distributive machinery. They supply the demands of such merchant tailors as have survived the competition of the wholesale clothing manufacture — and, as already intimated, these tailors still are of significance in the fabrication of men's-wear garments, even though much less important than they were a half-century ago.² Moreover,

¹ A number of concerns, once wholesale houses, became specialty jobbers, — houses carrying one line of fabrics. This type of concern has had a considerable growth in recent decades. For a full treatment of the modern jobbing mechanism, see Cherington, Chapter IX.

² Mr. John P. Wood in 1913 stated that "a very considerable proportion" of the domestic cloth production was disposed of in this manner (*Tariff Hearings*,

to the jobber are left the small clothing manufacturer and the lesser retail stores. On the whole, the number of such purchasers is large and their trade in the aggregate amounts to considerable in the course of a year. Nor is there prospect that units in distribution as serviceable as are these jobbing concerns will decline in importance, — or perhaps one should say, will decline any further in importance. "With uniform large-scale production at one end of the distribution mechanism, and diverse small-scale consumption at the other end, it seems evident that the function of collecting diverse lines and moving factory products in large quantities as far as possible toward the consumer before breaking them up is a necessary and important one."¹ Finally, I would not leave the impression that the commission house or mill selling-agent has disappeared. While the trend is toward direct selling and the establishment of selling offices and even separate selling corporations, many important manufacturing concerns still retain the older methods. Such for instance is the case with the Pacific Mills, the Atlantic Mills, and the Talbot Mills. And of course many of the small isolated establishments find direct selling too luxurious a method. Then, too, the intervention of the commission house or separate selling agency fulfills certain other services which have distinct value, such as independent criticism of the mill's style program. But on the whole, the practice of direct sale is better fitted to the scope of business carried by the modern woolen or worsted mill of substantial size.

Summary. The changes in selling methods during the period on the whole have favored the inauguration or expansion of large-scale manufacture, — at least in so far as they have not been the result of this development. The expansion in the operations of those large direct purchasers, the wholesale clothiers and the newer department stores, has been an immediate stimulus. Then the modifications in selling organization have put a premium

1913, iv, 4173). However, I am inclined to think that even for the time when this assertion was made, it involved some measure of exaggeration. Surely it cannot be said to picture accurately present-day conditions.

¹ Cherington, p. 149.

upon the enterprising concern that could take the initiative in revising the old system; and, perhaps more important still, they have given opportunity for the larger well-managed establishment to show its capacity to deliver goods promptly, cheaply, and in any volume desired, in competition with smaller mills. Greater emphasis than ever before has been put on bulk production. The response of the domestic industry to such opportunities, with its reaction upon quality as well as upon quantity of production, is an important feature in the industry's attainment of maturity.

CHAPTER XXVIII

GROWTH OF THE INDUSTRY

1. *Expansion of the Wool Manufacture as a Whole.*

MEASURED in absolute terms, the whole wool manufacture, i. e., including both the woolen and the worsted branches, has had an astounding growth in the last half century. The number of employees has increased by approximately 80 per cent; the number of looms has grown by over 90 per cent, while the type has changed from predominantly narrow to predominantly wide machines; and the quantity of raw materials consumed has advanced by nearly 165 per cent. The value of the products from these manufactures — or the value added by manufacture therein — has registered even greater increase, due chiefly to the rise in prices since 1895. For example, the value attached to the output of the mills in 1869 was reported as \$177,500,000; whereas by 1919 the corresponding figure was placed at \$1,065,000,000, representing an increase of over 600 per cent. By reason of the decline in the value of the dollar during the latter decades, this last ratio has little value by itself. Of the other indices, that of the quantity of raw materials consumed seems the most accurate and realistic. Accordingly, we can conclude that on the whole the industry today is something like two and a half times as large as it was in 1870. Considering the substantial development that it had already experienced at that time, this expansion is one of peculiarly great proportions.

However, lest the picture be too rosy, and in order that the wool-cloth manufacture may be seen in its proper relation, we should perhaps compare the growth in this field with that in other textile lines. The result is at first blush surprising. On the basis of the number of wage-earners in the several allied branches of the textile industry (Figure 21), the increase has been

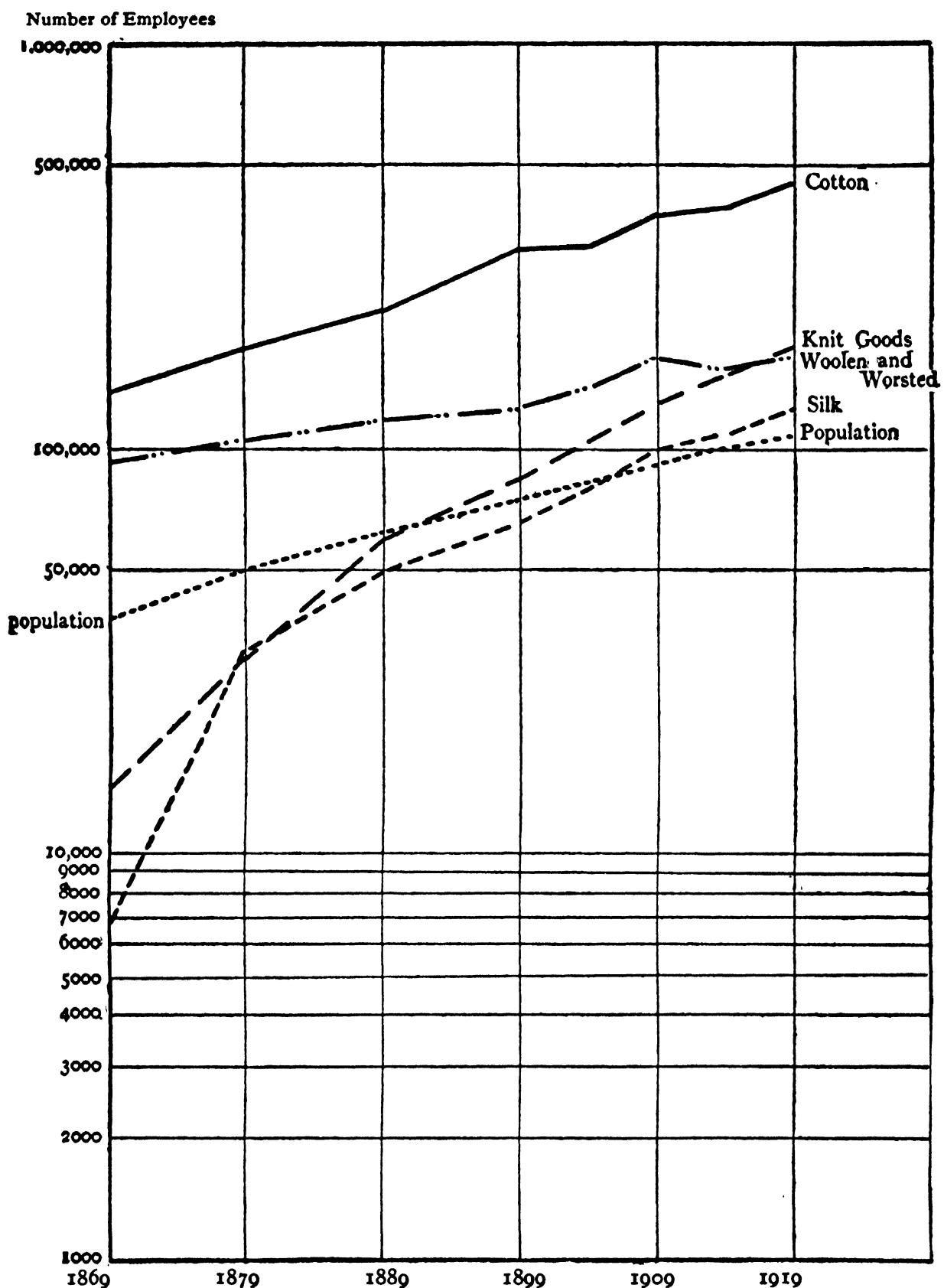


FIG. 21. Rate of Growth in the Wool and Other Chief Textile Industries (based on the number of employees and presented upon a logarithmic scale), 1869-1919.

less rapid than in cotton, knit-goods, or silk manufactures.¹ It may be noticed, too, that the woolen and worsted-goods manufacture is the only one among these four which has not chalked up a continued growth in the decade of 1909 to 1919. Again, if

¹ The accompanying Figures 21 and 22 are plotted upon the logarithmic scale, to exhibit the feature of growth as prominently as possible.

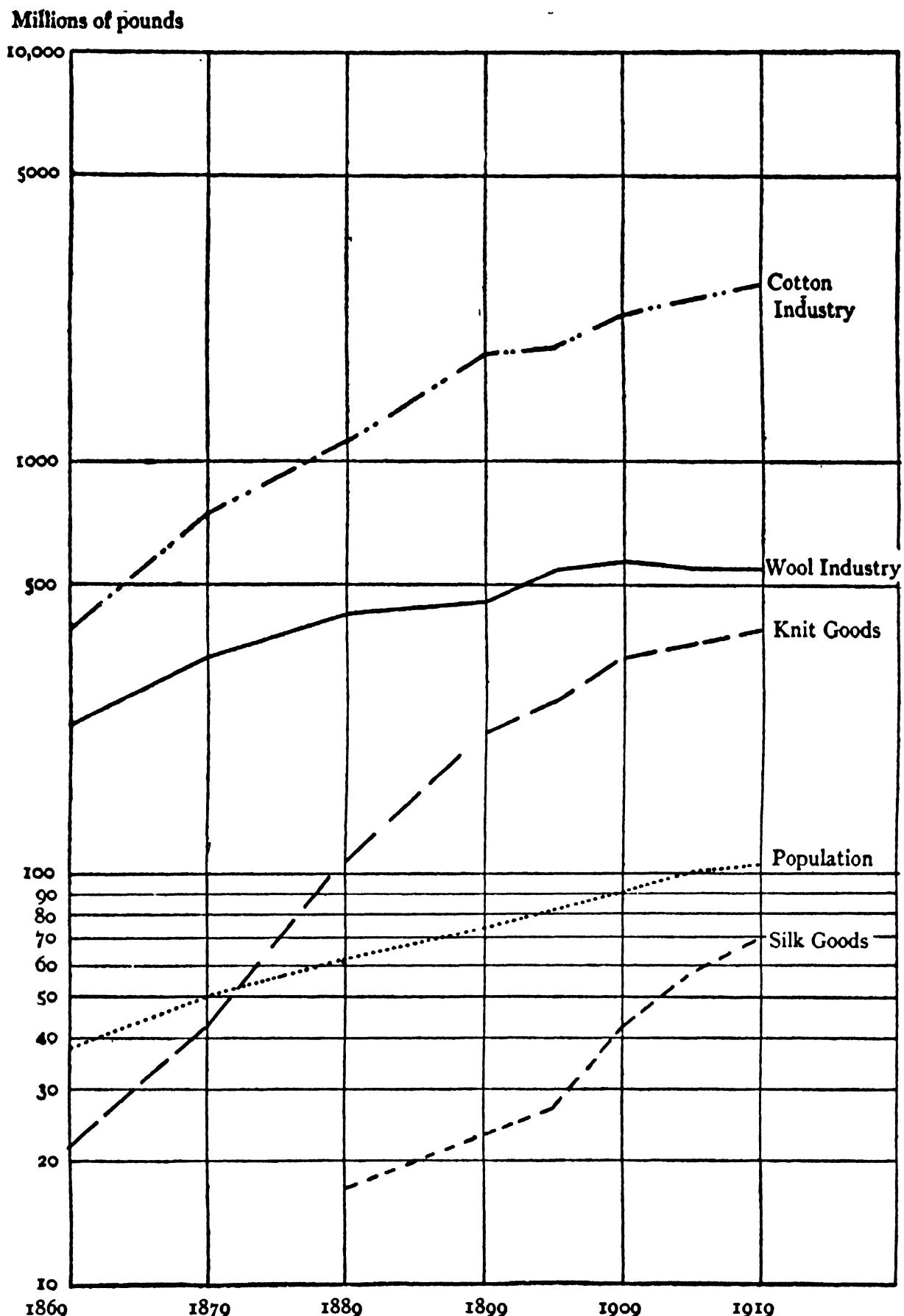


FIG. 22. Rate of Growth in the Wool and Other Chief Textile Industries (based on the consumption of raw materials and presented upon a logarithmic scale), 1869-1919.

we employ the basis of raw materials used (Figure 22), we find about the same situation. The several Census years have shown a steady upward movement, at least until 1909; but as the tilt of the lines indicates, the rate of advance has been less rapid than

in any one of the other industries. Moreover, the curve for wool goods, alone among the four, dips downward after 1909. A comparison founded upon the value added by manufacture in the several lines would display about the same results, except that the movements would be intensified by the changes in the value of money.

Such a condition obviously calls for explanation. In the case of the knit-goods and silk manufactures, a considerable weight should be given the fact that their development came much later than that in the wool or indeed than that in the cotton branch. In 1870 those productions were truly in their formative stage. For example, the silk industry was still confined to the weaving of ribbons, and the knit-goods industry was chiefly concerned with cotton and wool hosiery. Again, an appreciable allowance must be made for the fact that woolen and worsted fabrics have decreased in weight per yard during the period since 1870; and so a given weight of raw material would make up into a greater yardage. Not only has the dress-goods manufacture come to play a larger rôle in the American industry, but the average weight per yard of men's-wear and of women's-wear fabrics has declined. The latter feature is directly attributable to improvements in American living conditions, especially the betterment and wider employment of heating apparatus. Better heated (or superheated) houses, apartments, offices, and trains have reduced the dependence of the consumer upon wool garments for heat retention. In sum, then, statistics of yardage, if they were available for the whole period, would show a somewhat greater rise of production than the figures of raw-material consumption or of the number of employees.¹

¹ Statistics of quantity are not satisfactory as regards the whole manufacture until 1889; but we can secure some notion of the influence of the factor mentioned in the text if we compare the increase of production in terms of yards as reported by the 1890 and 1910 censuses with the increase between the same dates as indicated by raw-material consumption, — 1909 being the maximum point in the one case as in the other. On the basis of yardage, the advance was just about 50 per cent, whereas on that of raw materials consumed the increase was only 42 per cent. Obviously, while this correction is worth notice, it does not bulk sufficiently large to alter the general conclusions stated above regarding the broad movement during the period 1870 to 1920.

However, such considerations of the statistical basis of the above comparison do not invalidate the general contention that the wool manufacture has made relatively less notable advance than the other textile industries. Where shall we find the real explanation for this phenomenon? I would suggest the following factors and circumstances as going far in that direction. First, the growth in these several allied industries has been in marked degree at the expense of the wool-cloth manufacture. Cotton goods have in specific cases cut into the market for wool fabrics, as in blankets and summer suitings; while the competition of knit-goods has been even more important. Knit underwear has virtually driven the old flannel goods off the field; and in recent years jersey cloth for sport garments and women's suitings has grown rapidly in popularity. Knitted overcoating is not unknown, and knitted blankets compete with the woven type.¹ Moreover, the rising standard of living in the United States, while it has benefited the wool manufacture, has apparently influenced the other manufactures more considerably. This is especially true of the silk-goods industry, and of the silk end of the knit-goods trade. The improvements in heating apparatus just noted have been favorable to these manufactures, and antagonistic to that of wool. Not merely has the average unit weight of wool fabrics been diminished, but cotton and silk garments have taken the place of the former. And the emphasis on style which has come with a rising standard of living has also contributed to the same end. Silk and cotton garments — and for certain purposes, even knit-goods — preserve their shape longer and are more susceptible to fine treatment (form-fitting and the like) than the pliant and bulkier wool garments. Again, in accounting for the particularly rapid growth of the allied manufactures, some weight should be given the fact that we are not only using cotton, silk, or knit-goods in place of woolen or worsted, but are using a relatively larger volume of the former than in years gone by, — a volume which has grown more

¹ As knit underwear has driven the flannel under-garments pretty completely out of use, so has the cotton petticoat or silk underwear driven the old flannel petticoat from women's attire. Cotton shirtings also have more and more taken the place of the earlier flannel shirts.

rapidly than that of wool goods. Finally, in the case of cotton goods and, to a smaller extent, in that of knit-goods, the opportunity open for export trade has induced an expansion of the domestic industry. The low and medium grades of cotton cloth, as is well known, have had an important and a growing market in foreign lands; and the shipment of cotton hosiery and cotton knit-underwear has been substantial and increasing.

It is obvious, then, that the wool manufacture has enjoyed a peculiar and not wholly enviable position. Confined to the domestic trade by forces which did not hamper the whole or some parts of other industries, and harried by the competition of these other textile products, the wool manufacture has not had an easy place. It could grow with the increase of population, — although, really, it has hardly kept pace with this expansion of the country, population rising by approximately 175 per cent since 1870. The industry as a whole has never had a brilliant future to lead it on. It has had a constant struggle. Accordingly, the enlargement of operations which the industry has in fact registered is not a discreditable performance under the circumstances.

2. *Expansion of the Worsted Manufacture.*

While the survey just completed places the wool-manufacturing industry as a whole in the proper perspective, it passes over unnoticed the real romance of that industry for the period since 1870. The wool industry considered as a unit may perhaps have lagged behind the other textile manufactures; it may have been harassed by the growing power of these competitors; but within the wool manufacture itself, the young worsted industry was displaying a vitality and energy second to none in the textile field. It is of interest to compare the advance of the worsted production through 1909, the period of its active development, with the expansion of, say, the knit-goods manufacture, which may be taken to represent those more rapidly expanding industries of the foregoing survey. In number of wage-earners, the worsted manufacture increased 860 per cent, and the knit-goods industry, 875 per cent. In quantity of raw materials consumed, the former grew by 1925 per cent, and the latter by 1560 per

cent. On the basis of these two indices combined, the worsted manufacture obviously must be granted superiority.

However, the worsted industry, much more so than that of knit-goods, was built up through the trampling down of its older

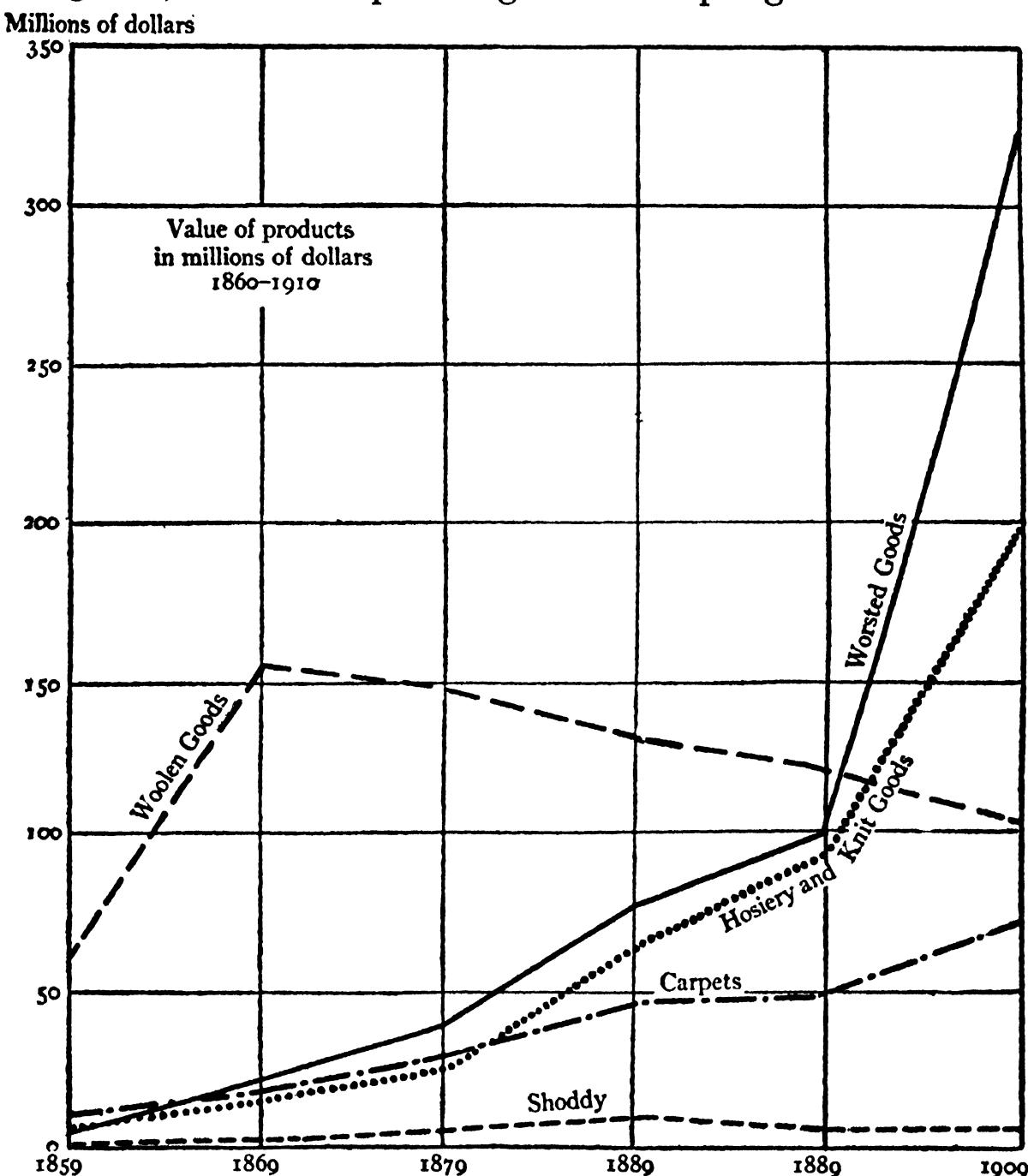


FIG. 23. Value of the Products in the Wool and Allied Manufactures, 1859-1909.

rival or rivals. While the production of worsted goods, measured in terms of value of products, was progressing steadily in the decades 1869 to 1909, the output of woolen goods, having reached a peak in 1869, tended continuously downward (Figure 23, in which the corresponding courses for knit-goods and for carpets are included for purposes of comparison).¹ By 1909 the value of

¹ Figure 23 contains a corrected figure for 1879. The Census of that year, it is alleged (Hayes, *Bulletin*, 1884, p. 282), included worsted goods to the value of about

worsted products was over fourteen-fold that in 1869, while that of woolen goods was less than three-quarters of the earlier figure. Gauged by quantity of raw material consumed, the picture is nearly as extreme: the weight employed in worsted mills rose nine-fold, while that in the woolen establishments, despite a greater use of wool substitutes, was scarcely as great in 1909 as in 1869.¹ Could a contrast be more striking?

To find the causes lying behind these diverse quantitative movements, one has to turn to a consideration of types of production. In 1869 the production of woolen goods towered above that of worsted fabrics: on the basis of raw materials employed it was approximately nine times as large. The worsted branch at that time embraced solely the production of lustrous dress-goods, — moreens, delaines, bareges, Italian cloths, and the like, — all constructed upon cotton warps. Such, too, was the character of the worsted manufacture generally throughout the world. In England, as in the United States, "the traders of that period believed there was to be a famine in long wool," — the fiber yielded by the English breeds of sheep, and that required for the worsted fabrics of the time.² Men's-wear goods, meanwhile, were wholly of the woolen type, the broadcloths, cassimeres, and the like, — cassimeres in that period being at the zenith of their popularity.

But a portentous change was already preparing. Improvements in combing machines were making it possible to treat not merely the old "combing" wools but ordinary "clothing" wools of greater or less merino strain; and the condition of the tariff was making it profitable to introduce the manufacture of such

\$12,000,000 under the sum of production attributed to the woolen branch. If allowance be not made for this item, the peak of woolen manufacture would come in 1879 instead of 1869.

¹ The statistics on which these conclusions are based do not include the quantities reported of wastes and noils consumed, nor the amount of merino yarns employed, nor the quantity of shoddy made in factories where consumed. Such data are not available all the way back to 1869. If such materials should all be included in the figures for 1909, increases (over the figures for 1869 minus such materials) would be registered in the cases of both woolen and worsted goods: a negligible 2.8 per cent in the former branch, as against one of 2074.8 per cent in the latter.

² *Bulletin*, 1902, p. 79: Mr. John W. Turner of Bradford, England.

wools into this country.¹ The class of fabrics the advent of which was to signal this quasi-revolution was the so-called worsted coatings. These were all-wool goods, not the cotton-warp type of the earlier stuffs; and they were heavy enough for men's wear, whereas the delaines, moreens, and such fabrics were suitable only for women's dress wear. The origin of the new goods seems to have been in France, the home of many novelties in textiles; but possibly the innovation became of importance first in England where the advances in combing technique had chiefly taken place. Transportation of the manufacture to the United States, according to one account, occurred as an indirect result of the International Exposition at Paris in 1867. Mr. E. R. Mudge, American commissioner at that exhibition, had been impressed by these worsted fabrics, which at that time were being worn in Paris and London, although still regarded as novelties. Upon his return to this country, he ascertained that American wools could be secured suitable for the fabrication of such goods; he sent orders to France for combing machinery of the proper type; and at the Washington Mills, Lawrence, Massachusetts, of which he was a leading director and the selling agent, Mr. Mudge set up in 1869 or 1870 the first production of worsted coatings in this country.² The honor of introducing this fabric is also claimed by the Hockanum Mills of Rockville, Connecticut; and apparently the commencement of manufacture there was quite independent of and approximately synchronous with that at the Washington Mills.³ Then came the adoption of the manufacture

¹ *Bulletin*, 1912, p. 390; Warburg, *Wool and Wool Manufacture*, 1920, p. 11.

² *Bulletin*, 1877, pp. 111-112; *ibid.*, 1880, p. 329; *ibid.*, 1884, p. 295.

³ "Special Report on Wool and Wool Manufactures," *Census of 1890*, vi, p. 57; and booklet entitled *The Arlington Mills*, 1891, pp. 90-92. In the case of the Hockanum Mills, it is interesting to note that Mr. George Sykes, vice-president and superintendent of the mills, who was responsible for the new development there, is said to have seen such goods in England, and repeats the claim that goods of this sort was first produced in Huddersfield, Yorkshire.

Mr. Henry G. Kittredge, editor of the *Boston Journal of Commerce* and writer upon the history of textiles, said: "It was not until the latter part of 1870, or the early part of 1871, that heavy worsteds were begun to be manufactured by these mills (the Washington)" (Special Report, *Census of 1890*, p. 57). According to this same author, "the first heavy goods marketed were with a twill face and

at the Wanskuck Mills in Providence, Rhode Island, and various other establishments.

The new goods were well received, coming after two decades or more of fancy-cassimere predominance. But there was no stampede toward this fabrication, as subsequent writers would have one believe. Cards and mules were not "thrown aside" to make room for combs and spinning frames, at least on any considerable scale. To be sure, the importation of Class I wools, those of merino strain and suitable for the new fabrics, exceeded that of Class II or "combing" wools in 1875 for the first time. Again, "the fabrics known as worsted coatings," displayed at the Centennial Exposition of the succeeding year, were spoken of by Mr. Hayes in his report as "the most formidable rivals" of the fancy cassimeres.¹ But according to the *Census of 1880*, such worsted goods seem to have reached at that time a yardage of but 5,765,000 yards, whereas woolen cloths, cassimeres, doe-skins, and the like (of all types) ran to approximately 75 million yards.² The progress, however, seems to have been steady and fairly rapid after that time. In 1886 a gentleman of the Philadelphia Textile Association asserted that of the (estimated) 563 combing machines existing in the country, over two-thirds were engaged upon worsted coatings or upon the manufacture of worsted yarns principally for use in such goods.³ With respect to all-wool fabrics for men's wear — the field where the worsted coatings were most important — the *Census of 1890* showed the basket back — a double cloth — made from the fifth sort of Canada wool" (*The Arlington Mills*, p. 92, note).

¹ Hayes, *Report upon the Exhibition of 1876*, p. 45. The direct competition of worsted coatings and cassimeres is indicated by the following sentence from this report: "Being woven in the fancy loom, either Jacquard or Crompton, and made for the same purposes and by the same manufacturers as the cassimeres, they differ from them only in the respect that the cassimeres are made of carded and the worsted cloth of combed wool" (*ibid.*, p. 45).

² The worsted yardage does not include the goods valued at 12 million dollars, which it is said were erroneously reported as woolen production. Also, it should be noted that the figure for woolen goods includes cotton-warp and union (mixed cotton and wool) fabrics. All-wool woolen goods cannot be separated. However, if correction could be made for these features, the picture would not be materially changed.

³ Mr. Truitt: *Bulletin*, 1886, p. 304.

quantity of worsted cloths produced to be approaching that of corresponding woolen fabrics: 17.6 million yards as compared with 25.3 million; and a decade later, the worsted yardage was substantially in the lead: 54.0 million as compared with 34.3 million yards. And thereafter the worsted output steadily drew away from its elder competitor.

Several factors have contributed toward the mounting success of the worsted goods for men's wear. The chief one undoubtedly was that of public acclaim. No other factor was sufficiently powerful to upset the previous dispositions of the wool manufacture and to give the new comer among men's-wear goods so great an impetus forward. Emphasis on this force is the more plausible since for the period after 1870 production in England and other countries manifested characteristics similar to that in this country: it was marked by the rise in worsted coatings and the decline, at least relatively speaking, of broadcloths, cassimeres, and the like. Subsequently, too, we shall have occasion to remark a reaction favoring the woolen fabrics, especially in the United States, which induced an increased production of such goods despite the fact that otherwise conditions had not changed.

Beyond this matter of style, there were several beneficent conditions, the influence of which should be noted: the nature of the world's wool supply, the American tariff, the change in average weight of domestic cloths, and the comparative efficiency of the woolen and worsted manufactures. Of the first, enough has already been said in our discussion of the demand for mutton-sheep and of the effects of increased settlement in wool-raising countries and regions.¹ The influence of the tariff has also been appraised. We should not be able to follow the ardent protectionists in their statement that "no fair-minded man can doubt that this new department of the wool manufacture (the worsted branch) was the creation of the tariff of 1867;"² but we can admit that the peculiar construction of the wool and woolens schedule did give special support to the worsted industry in the formative period, while in later years the rising height of

¹ See above, pp. 63-64.

² *Bulletin*, 1885, p. 44.

the duties enabled the industry to expand the range of its production to ever-higher levels of quality.¹

The gradual decrease in the normal weight of men's-wear fabrics has played into the hand of the worsted manufacture. This decrease has come through changes in manner of living and the rising standard of consumption in this country. "Within the memory of most of us," said a prominent manufacturer only a little while since, "the average weight of fabrics for men's winter suitings was twenty ounces. Now it is about thirteen. Cloths for the spring wear habitually weighed twelve to fourteen ounces. Now the average is probably less than ten ounces."² Lighter-weight fabrics require constituent yarns of finer diameter; and in the production of such yarns the woolen industry is at a disadvantage as compared with the worsted. A practical operator in the woolen branch has recently expressed the difficulties thus: "It is apparently quite impractical to consider spinning yarns on the woolen mule system from available wools, which will produce a woolen fabric of less than eleven to twelve ounces. In fact, fabrics of carded woolens in these weights can no longer compete on an economic basis with worsted fabrics."³ Perhaps the case is not so hopeless as this statement suggests; but unquestionably the woolen branch has been handicapped by this condition.

Finally, we may note that the comparative effectiveness of the worsted manufacture undoubtedly has been an important force during recent decades in fostering the expansion of that industry. The limited range of raw materials that this manufacture can employ, the simplicity of its finishing operations, and the standardization of its products all have given the worsted branch a

¹ See below, pp. 175 ff.

² Mr. John P. Wood, for many years President of the National Association of Wool Manufacturers: *Bulletin*, 1921, p. 259. Light-weight worsteds of the dress-goods type are spoken of as being in 1869, 12 ounces in weight (Special Report in *Census of 1890*, p. 57). A man in the woolen manufacture stated in 1921: "Twenty years ago we were able to sell 'light-weights' in suitings weighing 16-18 ounces to the 6/4 yard, while this season pieces that have left the mill weighing 12½-13 ounces are complained of as too heavy for men's wear" (Letter of manufacturer to the writer, December 14, 1921).

³ Letter to the author.

material advantage over the production of woolen goods. Although operating imperceptibly, this factor seems to have been of mounting influence in the whole worsted development; and perhaps in the production of worsted coatings the action of this factor has been more significant than elsewhere in the worsted manufacture.

But the explanation of growth in the worsted-coating production has taken us far afield. We should make note of yet other changes which came to the American worsted manufacture in the years following the introduction of these worsted coatings, and which also went to increase the operations of the worsted branch. The next one of particular importance relates to the manufacture of dress-goods. For the first years in the period under consideration, the type of dress-goods produced did not vary from that dominant in the preceding decades. Indeed, some new varieties of this former species were added to the American production, even despite the termination of the Canadian reciprocity treaty. Lastings, the sort of fabric employed as shoe linings, were first successfully manufactured in the years following 1867, perhaps encouraged by the tariff of that year. By 1876 it could be said that "at present the American shoe manufacturers are largely supplied by lastings of domestic production."¹ A few years later, or more specifically in 1872, the Arlington Mills, followed shortly by the Farr Alpaca Company of Holyoke, Massachusetts, introduced the manufacture of black alpaca, mohair, and similar fabrics, — goods which had long been a specialty of the Bradford (England) industry, and indeed still are to this day.² Again, for the first time bunting was produced on any considerable scale in this country. Begun by the United States Bunting Company of Lowell, Massachusetts, this manufacture has been continued ever since by them and by others, — to the satisfaction of Americans who feel an incongruity between nationalism and the foreign manufacture of our national emblems.³ But all these fabrics

¹ Hayes, *Report on the Exhibition of 1876*, p. 65.

² North, *Bulletin*, 1893, p. 267; Hayes, *Report on the Exhibition of 1876*, p. 65; *Arlington Mills*, 1891, p. 98.

³ Hayes *Report on the Exhibition of 1876* p. 65.

were of the lustre type, fabricated from the English "combing" wool, alpaca, or mohair. For the most part they were thoroughly in keeping with the prevailing trend in women's fashion, for these were the days of crinoline and outstanding skirts.

The year 1874 has been set up as the turning point, when such lustrous and hard-finished fabrics gave way;¹ but there seems to be little evidence to support the choice of that particular twelve-months' period. At best one can only say that the tide turned in the middle of the seventies. From the Continent had been coming soft, clinging, all-wool dress-goods made from wools of merino blood; and they captured the feminine fancy. Already attempts at the domestic manufacture of such goods had been made. For example, the Washington Mills of Lawrence, Massachusetts, are said to have essayed the production of "all-wool plaids made of fine yarns in imitation of the French goods," but had failed to make it pay.² The change in fashion introduced new conditions. The latter seventies and early eighties seem to have shown a marked increase in the production of the new fabrics, although, probably, "worsted dress-goods of French and Belgian patterns" had not by 1880 "almost entirely replaced the English or lustre worsteds."³ The tariff of 1883 took cognizance of this new development, and carried a separate paragraph for all-wool dress-goods. The rates therein contained yielded an increase in the protection for such goods — practically the only real increase of protection to wool products supplied by this particular tariff act.⁴ And the special duties on all-wool dress-goods were subsequently maintained, and maintained at rates of substantially the same severity, — at least until the Underwood tariff. Accordingly, the domestic production did not

¹ *Bulletin*, 1883, p. 40.

² *Brief Outline of the Business of Wm. Whitman and Co.*, 1910, p. 77.

³ *Bulletin*, 1880, p. 21. Five years later "soft dress-goods" are spoken of as having "recently come into fashion" (*ibid.*, 1885, p. 63).

Incidentally came a marked expansion in the variety of worsted-cloth production. "Fifteen years ago," says the *Census of 1880*, "only three kinds of goods were made; at present over 140 styles and patterns are produced" (*Census of 1880*, xxii, "Report on Wool and Silk Machinery," p. 18). The writer much underestimated the diversity of production in 1865; but the general sentiment is correct.

⁴ *Bulletin*, 1883, p. 166.

lack the aid which had already been extended to other wool fabrics.¹

The shift from lustrous to new duller and softer goods was, indeed, but the beginning of an important movement in the expansion of the worsted manufacture. The first dress fabrics of the all-wool type to be turned out were all produced on the Bradford system of worsted manufacture, that is, with the Noble comb, flyer drawing frames, and the cap spinning frame. They were "dull and soft" as compared with the brilliantines and poplins that had preceded them. But the movement was to go yet a step further. In the middle eighties came the introduction of the French or Continental method of worsted-yarn production, involving use of the modified Heilman comb, drawing without twist, and spinning on the worsted mule. Let me explain the difference between this and the earlier method. In the Bradford system a small degree of twist is imparted to the roving at an early stage in the drawing process, — in the process or series of operations by which the relatively thick strand delivered by the comb and gilling machines is reduced to a roving that in diameter is small enough to be spun. With each drawing operation the amount of twist increases, and the final yarn is more compact and more tightly twisted than the yarns produced by the French method. In the latter the combing operation retains in the top a larger proportion of the short fibers than does that with the Noble machine.² Then the drawing process, being carried through by mere drafting or elongation of the top, — on a series of machines, of course, — yields a roving which contains no real twist and which from the presence of the shorter fibers has a fuller feel. The latter quality is largely preserved in the spinning operation, since the degree of twist imparted on the mule is much less than that introduced in the several drawing and spinning operations under the Bradford system. In the cloth, too, the difference is

¹ See above, Chap. XXII. In fact, the importation of dress-goods tended steadily to decline during the years 1870 onward, more steadily even than that of cloths.

² Since the type of wool treated in the Continental system is generally of the short-staple variety, even the longer fibers in the top derived from it are shorter than those in the normal Bradford top. Thereby the number of fiber ends is increased; and, as noted below, this gives an added dullness to the finished fabric.

evident. That woven from yarns of the French system is of duller appearance, due to the greater number of fiber ends; it has less firmness or greater softness, by reason of the lower degree of twist in the constituent yarns; and for the same reason, it gives a fuller feeling in the hand, — it is more compressible.

Since the advent of the French system, dress-goods of the soft texture which it produces have steadily gained favor with the feminine portion of the American population. The exact measure of this advance cannot be ascertained. The only data relate to the percentage of worsted mule spindles in the whole American worsted manufacture. When in 1904 the Census first discriminated between frame and mule spindles in the worsted industry, the proportion of the latter was found to be approximately 25 per cent (26.4). Ten years later, it had reached 30.1 per cent and at about that figure it has remained since.¹ However, too much emphasis must not be given these figures. Some allowance must be made for the production of these newer yarns for use in men's-wear fabrics and in knit-goods. While such yarns are not typical material for "cloths," they may be employed in conjunction with the harder-spun and stouter Bradford yarns, — for example, as weft or filling yarn in the manufacture of "unfinished worsteds," — and, indeed, they are so used in substantial weights. Again, in the knit-goods trade, they find a sizable employment in the production of the softer scarfs and hosiery or in the supply of yarns for hand knitting.

However, even with the extension in the use of French-spun yarns to these other lines, it is apparent that production involving this more recently acquired system has not tended to grow in the last decade or so. Possibly the type of goods turned out by the French method or requiring the employment of French-spun yarns has now reached a more or less permanent status in relation to the total manufacture of worsted goods. That type is not satisfactory for all purposes, particularly from the point of view of durability. Perhaps with slightly less than a third of

¹ It should be noted that the ratio of French spindles above given is a proportion of the total American worsted spindleage, — not of the spindleage employed on dress-goods. What the latter ratio is or has been cannot be conjectured.

our spindles of this variety, the demand of the American market for specially soft and clinging fabrics (and that of the men's-wear and knit-goods trades for soft yarns) can be filled. This proportion, it may be noted, is much larger than that — less than 5 per cent — which exists in the British worsted manufacture.¹ By virtue of the protection extended in our high tariffs or of the more insistent demand for such fine goods on the part of the American public, or of both factors, we have been able to plant and nurture this foreign-sprung industry until its production goes far toward covering the total domestic requirements, while the British have been content or been compelled to rely chiefly upon importations for their supplies of cloths or of yarns suitable for their production.

The extension of the French system in the United States has been accompanied by the immigration of many Continental producers. These are French and German manufacturers who have moved their plants or, more generally, men who have established branch enterprises within the American tariff walls. Typical of these acquisitions is that of Forstmann and Huffmann, now leading manufacturers of dress-goods, with a large plant at Passaic, New Jersey. The modern directors are descendants of a concern which as early as 1853 was sending cloths to the American markets.² In 1903, impelled by the high duties recently imposed by the Dingley tariff, they erected a mill in Passaic, bringing over a nearly full complement of machinery and probably a number of technicians and foremen, and setting up in this country as near a replica as possible of their German establishment.³ A similar story could be told of the French-allied mills in and about Woonsocket, Rhode Island, and of other concerns with foreign connections that have located elsewhere in the country.⁴ The addition of this new talent to the American manufacture has

¹ According to the British census of 1918, there were 3,326,500 cap, ring, and flyer spindles in the British worsted manufacture, and only 139,630 worsted mule spindles, or a little over 4 per cent.

² See above, Vol. I, p. 343, note 1.

³ *Bulletin*, 1911, pp. 416-417.

⁴ One may specify among others the Botany Worsted Company, at Passaic, New Jersey; and very recently the acquisition of a Woonsocket mill by Masurel Frères of Roubaix, France.

been of distinct value, stimulating appreciably the advance of the domestic production.

The increase in the production of all-wool worsted dress-goods in general — the Bradford and the Continental types together — was rapid. At the time when statistics distinguishing all-wool from the other varieties are obtainable, that is, in the 1890 Census, this newer sort formed only an eighth of the total production, — including in this total production large quantities of satinets and linseys, linings, lastings, and the like. Ten years later the all-worsted type amounted to 45 per cent of the total, and in 1909 to nearly 60 per cent. From nothing in 1870 the output of all-worsted dress-goods in forty years had grown to overtop the rest combined. Yet the production of cotton-warp fabrics had not suffered so much as one might imagine at first thought. Though this section of the manufacture had declined relatively, it had fallen in absolute quantity less than 10 per cent. Under the influence of these two factors — the growth of the all-wool and the persistence of the cotton-warp manufactures — the worsted industry as a whole inevitably received a strong impetus to expansion.

3. *Experience of the Woolen Manufacture.*

The woolen branch of the industry, meanwhile, had been undergoing many hardships. Some of them are traceable quite directly to the successful competition of the worsted manufacture, but others flowed more immediately from such influences as changes in the tariff, rising standards of consumption, or inroads by branches of the textile manufacture other than worsted. In the field of men's-wear fabrics, the cassimere manufacture was apparently much affected by the particular form in which the rates on wool and the compensatory duties on cloths were organized in the tariffs of the Civil War and afterwards, as I have indicated in connection with the discussion of wool supplies.¹ Perhaps with some exaggeration for partisan purposes, the president of the Carded Woolen Manufacturers' Association has stated rather recently: "Three years after the passage of the

¹ See above, pp. 21-22, 68 ff.

bill of 1867, it became apparent to manufacturers of fine cassimeres that under that bill these goods could not be successfully manufactured and sold at a profit; with the result that nearly all the fine cassimere mills are now long out of existence.”¹ Yet undoubtedly the production of cassimeres was rendered relatively less effective when the high-shrinking mestizo wools were practically excluded. Not without significance in this connection was the inauguration of production, or at least the markedly increased output, of Scotch cheviots in 1868, together with over-coatings, — fabrics which could utilize the “coarser wool from mutton sheep.”² But soon came the newly developed worsted coatings, and the increasing competition from that source. In some measure the woolen-cloth producers could adapt their machinery to the new demands. Cassimere looms could be turned to the weaving of worsted coatings; and if the mill-owners were not ready to convert their yarn departments to the production of worsted yarns, they could purchase the latter from worsted spinning mills that were rising in numbers about this time.³ Meanwhile, too, with the improvements in combing apparatus, the worsted-cloth manufacture came to influence strongly, if not really to dominate, the raw-material end of the industry. In this matter the action from the men’s-wear section of the manufacture was supplemented in an important degree by that from the newly developed French system of worsted dress-goods production.

In the case of satinets and linseys, the active force affecting their production was the rising standard of living, although apparently this was supplemented by the increasing localization of the woolen-cloth manufacture. These traditional fabrics of American woolen production had been fabricated chiefly in

¹ Mr. Edward Moir, in *Tariff Hearings*, 1921, p. 2726. Cassimere mills in fact continued the fight against the various unfavorable circumstances for many years, although by the eighties the decline in that section of the industry had become quite evident. Mr. Moir’s idea of “long” ago may refer only to a period thirty years or so back.

² Hayes, *Bulletin*, 1879, p. 282.

³ Special Report in *Census of 1890*, p. 57; *Bulletin*, 1886, p. 103. The extent to which woolen mills took up the opportunity of worsted weaving is indicated in the several Censuses. In 1879, 27 per cent of all worsted coating produced came from woolen mills; in 1880 12 per cent; and in 1890 0 per cent.

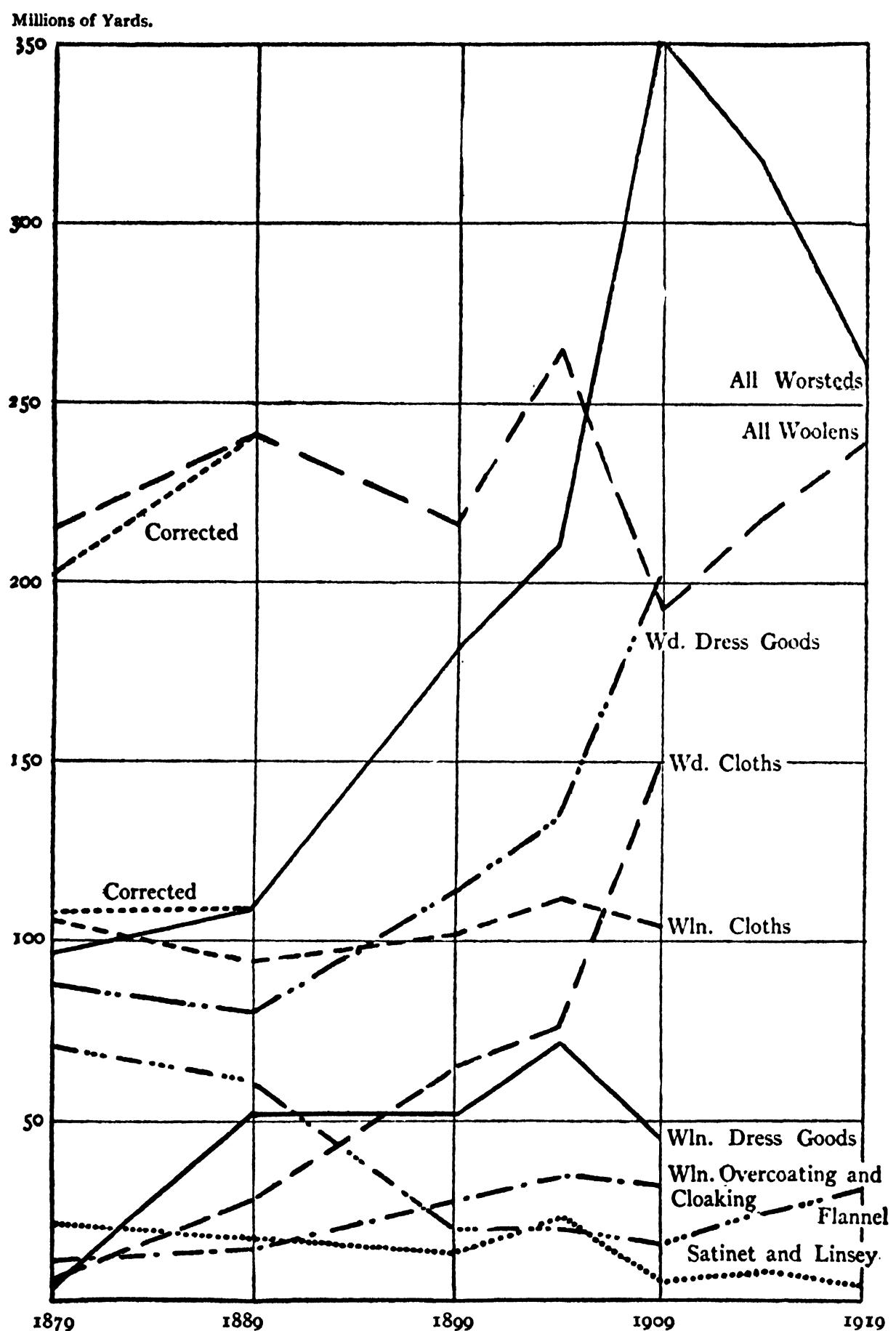


FIG. 24. Production of the Various Classes of Wool Fabrics (in terms of quantity), 1879-1919.

western and southern mills, — the small establishments that flourished on local patronage. With the improvement of transportation and of eastern mill operation, manufacturers of Massachusetts and other eastern states were able to undermine these

local enterprises, offering goods of better quality, or at least of better appearance, at prices which induced purchase. In consequence, the yardage of satinets and linseys turned out by American factories declined. In 1879 the production had been over 21 million yards (probably about that number of square yards), while by 1909 it reached only 4 million yards.

Flannels suffered even more acutely, the competition coming, of course, from the expanding knit-goods industry. The production of flannels — flannel shirting as well as flannel for underwear and pettiskirts — had occupied the full equipment of many woolen mills. Red, blue, and purple flannels, together with gray and blue shirtings, had been turned out by the mile in such establishments as the Gonic Manufacturing Company of Gonic, New Hampshire, the Stirling Mills of Lowell, Massachusetts, and the Groveland Mills, of South Groveland, Massachusetts.¹ As late as 1889 a production of 61 million square yards was reported; but a decade later only a third of that quantity (20 million square yards) was being woven.²

But the story is not wholly in this vein. For the woolen branch the period was one of readjustment under pressure, rather than one of any considerable decline; or, from the point of view of the whole industry, it was a period of mere standing still in the woolen branch while the worsted manufacture rushed forward. Apparently the woolen goods were not without their years of comparative popularity, as in 1904 (Figure 24); but the total volume of production soon came back to about the same figure as that from which it had departed. On the whole, the curve for all woolen goods shows some downward trend in the period 1879 to 1909; meanwhile the total worsted production appears to have risen from around 100 million square yards to three and a half times that figure.³

The readjustment in the production of the heavier woolen

¹ *American Wool and Cotton Reporter*, 1912, p. 19.

² Likewise, the blue flannel suiting for men's wear, which had been popular in the post-Civil-War period, gave way before the plain blue serge turned out by the rising worsted-coatings manufacture.

³ As already explained above, the statistics with respect to production are not satisfactory for the whole period 1869-1919. No figures upon quantity exist for

fabrics came largely through the development of goods with rough appearance, such as tweeds and cheviots, which would contrast advantageously with the smoother worsted coatings, and through the increase in the manufacture of overcoatings. Such goods were said in 1879 to constitute "the largest production of goods for men's wear in our mills."¹ The manufacture of overcoatings, with cloakings for women's wear, advanced from 11 million running yards (or probably about the same number of square yards) in 1879 to nearly 36 million square yards in 1904, or over three times the original volume. But perhaps the rise in production of woolen dress-goods was most striking. Such fabrics had been made up in woolen mills from the earlier times, though apparently in distinctly small volume as compared with men's-wear goods; and, during the decades 1869, and the data upon worsted production for 1879 seem to be untrustworthy. The actual increase of worsted-cloth manufacture between 1879 and 1909 was, I believe, substantially greater than the proportion spoken of in the text.

Data upon woolen and worsted machinery at the several Census periods tend to confirm the statement as to the general movement in the two branches as outlined in the foregoing pages. For purposes of reference, the figures are here presented:

Year	Woolen		Looms on		Worsted		Looms on	
	Woolen Cards	Spindles (in thous.)	Woolen Looms	Woolen Goods	Worsted Combs	Spindles (in thous.)	Worsted Looms	Worsted Goods
1869	8464	....	34,183	....	161	....	6,128	....
1879	6220	1774 *	35,549	....	360	338 *	9,488	....
1880	6167	2016 †	39,088	....	721	651 †	19,095	....
1890	5695	1935	34,881	36,584	1317	981	26,372	26,630
1904	5039	2141	32,957	38,104	1440	1190	30,910	28,123
1909	5099	1886	....	33,148	1978	1750	....	39,476
1914	4222	1816	....	28,866	2305	2225	....	46,581
1919	4836	2079	....	31,871	2197	2283	....	44,120

* Probably includes doubling spindles.

† Includes doubling spindles.

The figures for machinery are probably more accurate than those for production. Of the statistics presented, the most significant are those of woolen spindles, and of worsted combs and spindles. All these types of machines of course vary much in effectiveness from time to time; but probably those just mentioned, besides being satisfactory in other respects, have changed least since 1869. Woolen carding machines have steadily increased in width, and accordingly those figures are not of much value. The latter figures of looms, i. e., looms on woolen or on worsted goods, are satisfactory, but they do not go back very far. The data on "woolen looms" and "worsted looms" are probably inaccurate, as far as judging from them the general course of the separate industries, since woolen looms could be used on worsted goods and vice versa. However, it is evident that the machinery figures do corroborate the other data already introduced.

¹ *Bulletin*, 1879, p. 282.

immediately preceding 1870, worsted dress-goods of the delaine type had dominated the field. Even in the statistics of production presented in the *Census of 1880*, less than 5 million yards of fabrics that can be characterized as woolen dress-goods were reported. In the production of such fabrics, however, a start had been made soon after the close of the Civil War. The story was told to me by an old foreman of M. T. Stevens and Sons Company that in 1867-1868 that firm began the production of a dress-goods for women called Arabian suitings. It contained 40 per cent of cotton, was produced in various color mixtures, and woven in a four-harness twill. According to this account, the concern made a considerable success of the new departure.¹ Unquestionably, the volume of fabrics more or less similar to this increased with considerable rapidity. In 1889 a production of 52 million square yards was reported, comparing favorably with the 79 million square yards of worsted dress-goods, Italian cloths, etc. recorded for the same date. Thereafter the increase was more rapid in the case of the worsted goods, but the manufacture of woolen dress fabrics continued to form an important section in the older branch of the industry. To the fabrication of such goods, the flannel manufacturers turned in considerable numbers when the bottom dropped out of the market for flannels; and in later years, with the enhanced demand for women's sport and out-door fabrics, — goods of heavier weight, — many producers of men's-wear woolen cloths found it advantageous to run lines of these newer stuffs.

Thus, by some changes in the character of the cloth production itself, as also by the development of the overcoating and especially of the dress-goods manufactures, the woolen section of the industry was tided over the period of stress.² In this read-

¹ Interview with Mr. William H. Jowett, April 29, 1922.

Another considerable product of woolen mills in the early seventies, which belongs in the same category, is the woolen shawl. This article had quite a vogue and provided employment for much woolen machinery.

² As to coarse woolen fabrics, one may note that as late as 1902 goods of the character of Kentucky jeans — a mixed cotton and wool fabric — were said to be "worn in enormous quantities by the agricultural populations of the great West" (*Bulletin*, 1902, p. 42).

justment the quantity of machinery suffered no great diminution at any time, and the output decreased less than one might imagine, though of course relatively the woolen manufacture fell far behind the worsted branch.¹ But whatever the results of this long distressed period upon volume of woolen production, the effects thereof upon the efficiency of the woolen industry may well have been considerable. The woolen branch may have been less adequately prepared to resist foreign competition, as in the periods of lowered tariff duties; and this fact may account for the general tendency for woolen importations to increase more considerably than worsted in the years after 1897.² Again, this general weakness in the woolen end may account in part for the tendency of this manufacture to continue the employment of old machinery in a degree contrasting notably with the practice in the worsted branch,—a fact developed in the Tariff Board's report.³ Indubitably, this general experience of the woolen manufacture is one of the outstanding features of the period since 1870.

However, the expansion of the worsted industry reached the top of its power a decade or more ago; and the reaction in favor of carded-wool goods during the last decade or so is peculiarly noteworthy. In the fall of 1909 the turn came. The change is noted in the American Woolen Company's report, and the secretary of the National Association of Wool Manufacturers in his survey of 1909 stated: "One notable feature of the year . . . is the new and broad prosperity that has come to the carded woolen branch of the manufacturing industry. Fashion has once more

¹ On decline of woolen-cloth production, see pp. 164-167, above. As to woolen machinery, the figures for woolen spindles are the best index. For these, see p. 167, above, note 3.

² See above, pp. 52-53.

³ *Report on Schedule K*, p. 1042. The comparison most unfavorable to the woolen manufacture is as follows:

Percentage of total machines for which data were secured, according to the number of years which they had been in operation.

	Less than 5 years	5 to 14 years	15 to 24 years	25 years and greater
Woolen cards	9.6	31.0	12.4	47.0
Worsted cards	26.3	33.2	32.9	7.6

Of course some allowance must be made for the more recent growth of the worsted branch; but this seems an inadequate explanation.

approved carded woolen fabrics."¹ Moreover, since that time, as statistics of production (Figure 24) and of machinery indicate, the trend has been strongly in the direction of such goods. The increase in machine equipment between 1914 and 1919 of course might in large part be attributed to the influence of the World War, since the military demand was more largely for woolen than for worsted goods. Yet the statistics of production for the year 1919 show the continued movement in favor of woolen fabrics. The real explanation seems to lie in certain changes in modern life, specifically, the increasing domination of the automobile and the growing popularity of golf. Wearing apparel for use both in automobile driving and on the golf course is better constructed out of woolen than out of worsted fabrics. In the one case, wrinkles are less obvious and less enduring; and in the other, the loose effects are more readily secured, while of course custom itself requires the employment of homespuns, tweeds, or similar woolen fabrics. In addition, as factors working in the same direction, one might note that a reaction from a long dominance of worsteds was not an unlikely affair, just as fancy cassimeres had earlier driven out the stately broadcloth in considerable measure and the worsted coatings in turn had successfully contested the field with the fancy cassimeres; and, again, that during the period of the Underwood tariff woolen manufacturers secured supplies of foreign low-priced wools with greater facility than for some time previously. At any rate, the reversion to carded-wool goods has meant a minor revolution in the wool manufacture. Producers of the present generation had been accustomed to a control of the cloth market by the worsted branch. They have awakened now to a realization that the latter has "had its day."

Under present circumstances, the future of domestic cloth production is difficult to forecast. Conditions are still in flux.

¹ *Bulletin*, 1910, p. 8; *Annual Report of the American Woolen Company*, 1909, p. 2. See also *Bulletin*, 1909, p. 524; and *Report on Schedule K*, pp. 86-88. The story exists that the shift was induced by the wholesale clothiers who felt that the worsted-cloth manufacturers had been too grasping when the tariff was revised in 1908-1909. Whatever the truth of this matter, surely this factor alone would not have sufficed to change the course of a half-century development.

There is, to be sure, little or no likelihood that the pendulum will swing back till the woolen branch of the industry regains the position of supremacy that it held in 1870. The popularity for the strong, finished-looking worsteds, as distinguished from the rough, heavy woolens, is too strong with large sections of the American public, while the demand for the lighter-weight fabrics, as already suggested, plays in favor of the worsted manufacture. On the other hand, we may reasonably expect that the worsted industry reached an extreme position in 1909, and that for some years the production in the two branches may oscillate between the ratios set, say, by the outputs in 1909 and 1919. In short, possibly the wool manufacture has reached a measure of stability in production, which in itself is an indication of increased industrial maturity.

4. *Changes in Quality of Production.*

There remains yet to speak more specifically about the qualities of fabrics produced in both the woolen and worsted manufactures, to which only passing attention has been paid so far. In this regard the movement during the period since 1870 has been two-fold: there has been a development of standardized goods of medium or lower qualities, and the apparently contrary action, especially toward the end of the period, of a gradual heightening in the quality of production. The country's production in 1870 was chiefly of the medium and lower grades in fabrics; and the development of standardized goods was mainly a readjustment in production. The rise in quality of manufacture, on the other hand, was a distinctly novel action.

The production of standardized goods was much facilitated by the arrangement and character of operations of the worsted industry. A manufacture of worsted yarns, supplying the woolen mills that wanted to turn their looms to the weaving of the new worsted fabrics, was early set up. Being made of new wool only, and under a system of manipulation which aims at reducing any unevennesses or irregularities in the original mixture of fibers, worsted yarns are distinctly homogeneous products and have become much more standardized than their cousins,

the woolen yarns.¹ But going a step further, worsted manufacturers found it possible to devise fabrics which could be turned out in bulk upon uniform and rather simple constructions. The origin of most such fabrics seems to have been abroad. For example, clays were improvised by and took their name from a concern in Halifax, England. Others, such as the popular serge, were merely adaptations of a fabric that had been manufactured for centuries, even running back to the old handicraft manufacture of Norwich, England; or, like the unfinished worsted, were devised in imitation of woolen goods. In dress-goods, too, one finds the same phenomenon. Such fabrics as tricots, cashmeres, and light-weight serges became standardized and were produced year after year in constant form. Later still, with the further differentiation of the worsted manufacture, tops or combed wool became a fairly homogeneous article of commerce.

But the process was not wholly confined to the realm of worsted goods. Though less adapted to standardization, the woolen branch of the industry produced certain fabrics which matched in this particular the serges and cashmeres of the worsted manufacture. Apparently, the production of satinets in an earlier period had been somewhat on this order. More recently and more significantly, cassimeres and certain types of overcoating had proved susceptible to the same treatment; while blankets and flannels were among woolen goods the most thoroughly standardized of all. Yet on the whole, the woolen industry made less progress in this direction than did the younger worsted branch, especially if we confine our attention to fabrics for outer

¹ In the production of woolen yarn, there is, to be sure, attempt at a thorough mixing of the fibers, this being a primary function of the carding process, which in the woolen branch of the industry is more thoroughgoing than the analogous process of the worsted manufacture. However, after the close of the carding operation in the woolen end, the die is cast, as it were. The transformation of the slubbings into yarn is accomplished at one operation; whereas in the worsted combing, drawing, and spinning processes there are almost innumerable doublings and mixings. In eight drawing processes alone, there are something like 1,024,000 doublings in an ordinary drafting operation (Priestman, *Principles of Worsted Spinning*, p. 111). In addition, there is of course the fact that the woolen industry employs a diversity of materials, making standardization more difficult. But even in yarns of new wool only, the task is not an easy one.

wear. The diversity of materials and the possible variations of finish in the case of woolen cloths, together with the general position of the woolen manufacture during the greater part of the period since 1870, combined to encourage diversity of product rather than standardization.

The reasons for this development in both branches of the industry are not hard to find. The rapid expansion of the domestic market, protected from serious foreign competition by the new tariffs, has brought increasing stability of production in American mills, together with enhanced unit orders from jobbers and other distributors. The rise of the wholesale clothing trade, particularly, has been of much influence. The clothiers have purchased in sizable lots; they have devoted their attention largely to goods of medium and low quality (where alone of course standardization has been found possible); and their wide distributive systems have assured them of regular, year-in-and-year-out sale of certain types of goods. Given steadiness and considerable volume in the demand for a specific line of goods, some degree of standardization of production is likely to develop.¹

But let us turn to the other phase of the subject, the more recent rise in quality of production.² The manufacturers in the

¹ It is significant that the price series collected by the Aldrich Commission of Wages and Prices generally commence in the seventies or at best the later sixties. Apparently, homogeneous data were not available for earlier decades. Certain series for broadcloths, cassimere, and blankets form the exceptions.

² Here at the outset, note should perhaps be made as to what is meant by high quality of production, and what its relation is to the raw material used and to standardization of output. Difficulties immediately beset us. The variety of wool fabrics is nowadays so great that exceptions may be found to nearly any statement upon the particular matter at hand.

Quality, it must be admitted, is not merely a question of the type of raw material employed. A distinctly good grade of fabric can be manufactured from a mixture containing a substantial proportion of shoddy; and three-eighths and half-blood wool can readily be worked into cloths of superior character. On the other hand, the finest merino staple may be employed, and not exceptionally is employed, in the production of standardized fabrics. The well-known botany serge is an example of this manufacture. And, from one point of view, a fabric made from fine wool is unquestionably a fine-quality article. However, I have in mind as determinant of high quality a combination of elements. A superior grade of raw material is normally employed, since the advantage of the manufacturer would usually dictate its use — it would not generally be advantageous to him to devote par-

decades immediately following 1870 seemingly were content in the competition for the growing domestic market to put their efforts into quantity production. We hear little of the high quality of American goods at that time. The fabrics supplied the ready-made clothing establishments were said to be of the lower classes, — even nine-tenths of that industry's purchases.¹ In the middle of the succeeding decade, 1886, the estimate of a prominent Philadelphia manufacturer indicated that two-thirds of the country's combing machines were then running upon wools at or below half-blood quality.² Even as late as 1894 it was stated that three-quarters of the total production of cloths by American mills was worth less than forty cents a pound in value.³ Soon after this, however, the change began to be evident, perhaps influenced by increased urban concentration and the rising wealth of the country, and doubtless encouraged by

ticular attention to the working-up of inferior stock. Secondly, cloths of this quality normally involve a special degree of designing. There is a delicacy, complexity, or distinctiveness of style, which lifts such fabrics above the common types. Indeed, variety of design and an endeavor to catch the prevailing whims of fashion are characteristic features in fine-fabric production. Finally, there must be a high quality of workmanship. In large measure, to be sure, this necessity also exists in the case of such goods as the botany serges above mentioned, the standardized or quasi-standardized superior fabrics. Even here greater care and skill is demanded than is called for in the production of medium or low-grade goods. But high craftsmanship is at least quite as necessary for the high-quality cloths as I have described them; it is a *sine qua non* of first-class manufacture. Cloths embracing these three elements — high-grade staple, individuality of style, and a high order of workmanship — are taken as typical of "fine" fabrics, although it is appreciated that many goods, undoubtedly of high quality, may fall short of this standard upon one count or another.

¹ *Bulletin*, 1885, p. 227.

² *Ibid.*, 1886, p. 304. Mr. Truitt's figures are as follows: Machines running on X, XX, and above, 187; on three-eighths or half-blood, 152; and on quarter-blood and braid, 224.

As suggested in the above footnote (p. 174), quality of raw material is not the sole determinant of quality in product. However, it is a fairly satisfactory clue; and it is one of the few indices upon which data are available.

³ *Ibid.*, 1894, p. 255. The action of the tariffs prior to 1890 and especially 1897 in letting in more easily the cloths of higher value may well have had an influence. For example, the average value of cotton-warp dress-goods imported in 1890 was, duty-paid, 33 cents per square yard, and of all-wool dress-goods, 38 cents. American production of dress-goods, on the other hand, averaged in that year 25 cents per square yard.

the higher protective duties of the long-lived Dingley tariff. Mills which had been satisfied to copy European fabrics after these had found favor with the American buying public, now took to sending representatives abroad to get into closer touch with the London or Paris designers. Mills gave greater attention to their "fancies" and let their "staples" coast alone. Woolen goods, worsted coatings, and worsted dress-goods all felt the influence, — the last group of fabrics perhaps most of all.

The growth in Continental system of worsted-yarn production is of special importance in connection with the rising quality of dress-goods manufacture. The introduction of this production came in the eighties, but expansion came particularly in the succeeding decade, accompanied by the importation of foreign capital and the immigration of foreign manufacturers. Now, while worsted yarns of this sort are themselves as homogeneous and as susceptible to standardization as yarns of the Bradford system, they are not so advantageously and economically produced. Moreover, the general character of the goods into which they are customarily converted is more or less luxurious. The yarns are not so strong as those of the other system, and they make up into a cloth which is less firm and durable. Advantage in the employment of the French-spun yarns lies only in the manufacture of high-quality fabrics. Accordingly, there has come a gradual "edging up" in the quality of dress-goods produced by use of these yarns, proceeding as fast as efficiency of production in the new environment, acceptability in the domestic market, and propitious tariff conditions have permitted. So considerable has been the advance of the domestic manufacture in this line that a competent foreign observer recently stated it to be "impossible to exceed in beauty of texture and colour" the best products of American factories.¹ Although such production, to be sure, cannot be carried on so effectively as most other lines of wool manufacture, and is particularly exposed to the attack of foreign importations, we need not here cavil at

¹ Professor Barker of Leeds University, England, in his booklet called *A Summer Tour through the Textile Districts of Canada and the United States*, p. 187.

such drawbacks. The attainment of such high quality is a distinct accomplishment in the face of American economic conditions. And incidentally it serves to emphasize the degree to which the trend toward production of fine-grade fabrics has gone.

Prior to the war, movement toward higher quality of production was, as I have suggested, a gradual affair. There were no striking changes, but each year machinery dropped out of the coarser and came into the finer manufacture. Then came the war period, and especially the early post-war period, when the movement became more pronounced. "Everyone appears to be interested in the production of fine fabrics," was the report in 1920.¹ At that time the price of merino wools rose out of all comparison with crossbred staples, some of the latter, indeed, falling in price to their pre-war levels; and the markets were swept clean of the finer qualities. The position of merino prices was unstable under the conditions; but one should note that even subsequent to the crisis of 1920 prices of merino staple have remained disproportionately high. Perhaps a famine of fine wool threatens. This recent development, however, is of interest to us only because it throws into relief the trend in wool manufacture which has been manifest for the last fifteen or twenty years.²

¹ *American Wool and Cotton Reporter*, January 1, 1920, p. 36. Expressions of similar views are frequent in the textile journals of that period.

² Again the relation of quality in raw material and that in product enters to rob this post-war experience of some significance for our present consideration. Moreover, here there is said to have been such variation in the movements of wool prices, wages, and other costs in the whole cloth and garment manufacture that the use in the garment production of cloths made from fine wool (though not otherwise of "fine" quality) was indirectly encouraged: the enhancement in the cost of the finished suit or overcoat by the use of these cloths was not sufficient to cut much figure. I myself have been skeptical of this argument except as applying to a distinctly temporary condition shortly after the armistice. However, if true, some allowance must be made for the increased manufacture of high-grade goods of semi-standardized type, such as botany serges and clays: an increase in the employment of fine wools would not mean a proportionate expansion in the production of high-quality fabrics as I have defined them (see above, p. 174, note 2). Yet there is this to be said: the greater use of fine staples has, I believe, meant a substantial increase in the manufacture of really high-quality fabrics — the allowance just noted would not divest the figures of wool consumption of all signifi-

The general course of enhancement in quality is evident in the figures of raw material consumption within the industry. The consumption per spindle in worsted mills fell from 127.9 pounds per annum in 1904 to 93.9 pounds in 1914, and to 83.9 pounds in 1919. Consumption per spindle in woolen mills declined less markedly, yet in a substantial degree, — namely, from 140.9 pounds per annum in 1904 to 133.6 pounds a decade later, and to 112.8 pounds in 1919.¹ The general movement is also evident in increase of value per yard of product as reported by the several Censuses. Thus in the years 1889 to 1909, the average value per yard of all-wool woolen and of worsted dress-goods was (subsequent Censuses do not permit a continuation of these figures into later years):

	1889	1899	1904	1909
Woolen dress-goods	35.7	38.6	40.5	56.3
Worsted dress-goods	34.5	28.2	41.8	51.1

The period after 1896 was, to be sure, one of generally rising prices; but the advance in these prices was more extreme than the general movement. Figures of this sort for various other groups of wool products — all-wool "cloths," cotton-warp over-coatings, and the like — do not show the same degree of appreciation; nor would one expect it. The manufacture of all-wool dress-goods has been the section of the whole wool-manufacturing industry in which the tendency to highest-quality production has been most conspicuous.

cance — and, secondly, in so far as these quasi-standardized, high-grade cloths share in the general characteristics of the latter fabrics, involving greater care and skill in production than other goods, they are not to be disregarded wholly in the discussion of the recent tendency.

¹ The decline in consumption per worsted spindle is subject to the qualification that during the period 1904-1919 there was an increase in the number of French-system spindles. The requirements in raw material of these spindles is substantially lower than that of frame spindles. Still this factor is insufficient to account for the whole change. The proportion of mule (or French-system) worsted spindles to the total number of worsted spindles in the country increased merely from about 25 to about 30 per cent. It is interesting to note that as closely as one may ascertain the facts, American and British consumption per spindle of wool were substantially similar in 1918-1919. Lumping woolen and worsted spindles together, consumption in England in 1918 equaled 113 pounds per spindle, while in the United States during the succeeding year it equaled 111.9 pounds.

Yet I would not give the impression that the American manufacture had become predominantly a production of superfine fabrics. That would be wholly erroneous. No wool-manufacturing country possesses such a one-sided industry. For the United States, neither the conditions of the American market nor the situation on the producing end would support this sort of manufacture. Mr. Forstmann in 1913 divided domestic consumption into the following portions: 60 per cent of cheap goods, 25 per cent of medium-grade fabrics, and 15 per cent of really fine fabrics. Of the last, he said, something like a third came from abroad.¹ This analysis is not wholly acceptable. Since Mr. Forstmann was a manufacturer of the finest dress-goods produced in this country, perhaps his idea of "cheap," "medium-grade," and "fine" fabrics was a peculiarly elevated one.² Moreover, conditions have altered somewhat since 1913. With the improvement of general conditions there has come an increased demand for goods of medium and fine qualities. In 1919-1920 high-grade fabrics could not be turned out in sufficient volume; and something of this condition has persisted into more recent years. Anyway, this analysis is unacceptable as applying to the present situation. Domestic production (ignoring importations) is now to be divided perhaps into 40 to 45 per cent of essentially cheap goods, 35 to 40 per cent of medium-grade fabrics, and 15 to 20 per cent of high-quality goods. The fine-cloth production is by no means the dominant factor in the domestic manufacture. It is merely an appreciable proportion of total production and something more than an exceptional affair.

The continuance of this fine-quality production in the domestic industry, we may add, is beset with some difficulties. The trend in wool culture, for example, is adverse to the maintenance of the world's manufacture of fine goods. With the further settlement of Australia, Argentina, and western United States, and with no new sources of merino wool opening up, there is even threat of a fine-wool famine. However, for some years the

¹ *Tariff Hearings*, 1913, iv, 4271.

² Mr. Forstmann was also interested in making a case that foreign fine goods formed a rather high percentage of domestic production in this quality group.

American production of high-grade fabrics seems secure. While American effectiveness in our "export" industries remains high and while the United States continues to hold a markedly strong position in international finance (as in the years since the World War), the country will be able to draw here as much fine staple as in the past; and the prosperity of the American people will create a demand for fabrics of high quality. Sheltered behind a substantial tariff wall, the domestic industry should be able to maintain for some years the production of such goods.

Summary. The changes in quality of wool-cloth production have been influenced by two somewhat antagonistic forces. With the extension of the domestic market, and particularly with the development of the wholesale clothing manufacture, came a considerable standardization of product. To this end the rise of the worsted industry was of particular importance, since technical conditions there made for greater homogeneity in output. And this tendency in the whole domestic wool manufacture contributed appreciably to the growth and strengthening of that manufacture. On the other hand, recent decades have brought a movement away from the output of standardized goods to the production of fine qualities of fabrics. High quality and standardization are generally incompatible elements in any production. The one demands special style, individual touch, and unusual workmanship, or everything in contrast to the characteristics of standardized operation. This development in quality production filled the gap in supplies caused by the diminution of imports after the higher duties were imposed; or, perhaps better, it came largely as a result of the handicaps placed in the way of importations by the higher tariff rates. In consequence of these two tendencies, standardization and the special growth of quality production, the American wool manufacture has expanded to cover practically the whole field of domestic requirements. Importation of some goods still continues, but this is caused largely by peculiar circumstances. To be sure, the domestic development of high-quality production in men's-wear fabrics has not been carried so far as that of high-grade dress-goods. Yet the import movement in general is kept up by the

force of popular prejudice, the desire for novelties, a limited demand for purely handmade fabrics, and the like. The expansion of the domestic wool manufacture since 1870 has been as conspicuous in the matter of variety as in that of quantity of production.

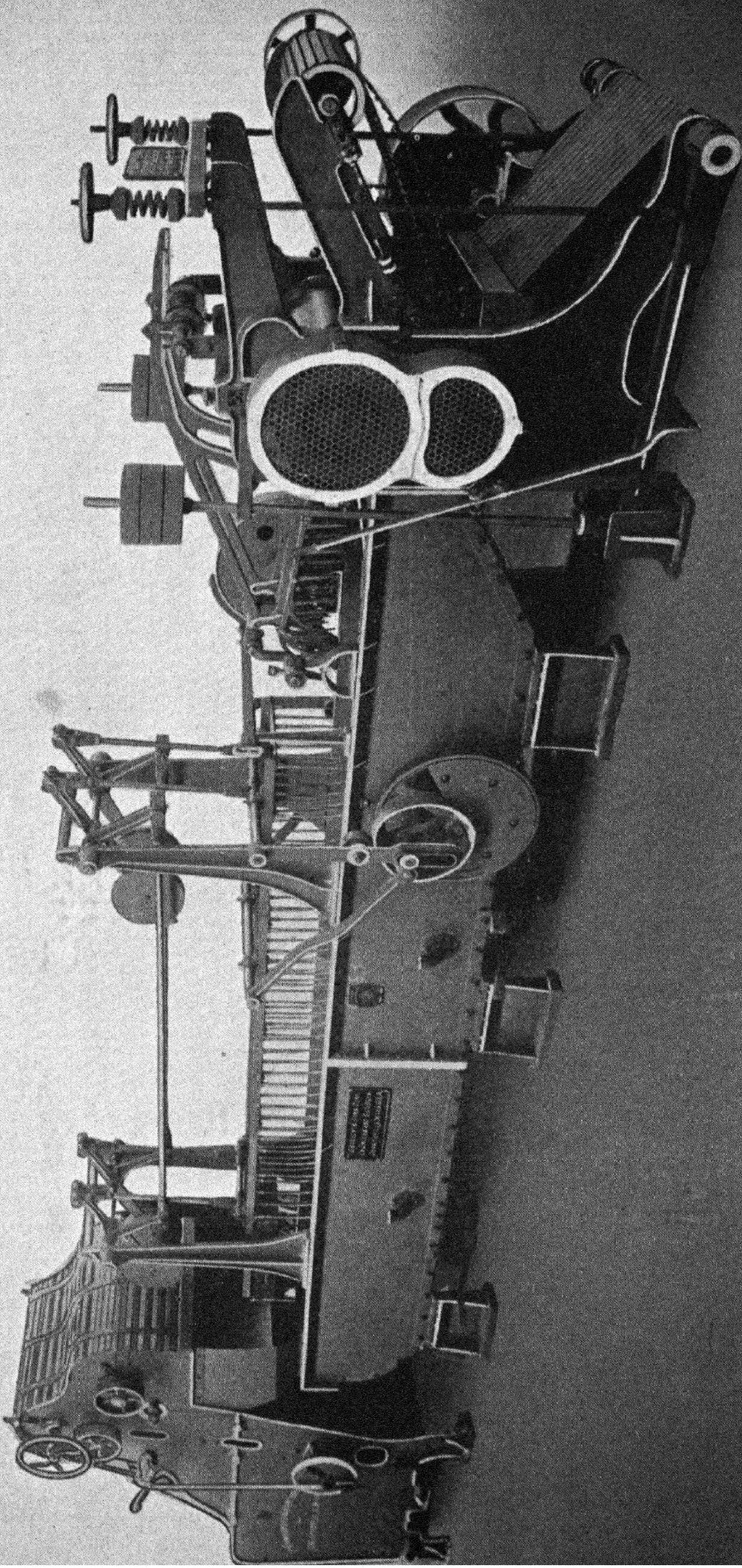
But there is another aspect of this recent development which is of much significance, an aspect related to industrial maturity. Usually, industries have not been transferred to a new environment complete at a single step, but gradually and piecemeal. On the side of quality, the first portion of the manufacture adopted has customarily been the coarser and commoner grades. Later has come the rise of production in the finer qualities. With respect to the domestic wool manufacture, accordingly, the acquisition of nearly the whole range of quality is a clear indication of the relative maturity of that industry. Because of the industry's dependence upon the tariff, it is a sort of artificial maturity, — a hothouse maturity, we might say, — but the situation in the wool manufacture suggests beyond question that the infant stage of development has been left far behind.

Finally, the attainment of nearly the whole range of manufacture, as regards both types and qualities of production, as well as the substantially complete provision in quantity for domestic requirements, makes probable a relative stability in American output, — barring, of course, changes in the domestic demand or in the tariff. So likewise does the reaction of popular taste in recent years, which has blown new life into the woollen branch of the industry. The trend toward worsted domination has ceased, seemingly; and — again barring the changes just mentioned — the division of the field between worsted and woollen production may be expected to oscillate close to the present conditions. Maturity has been accompanied, as perhaps one would expect, by a comparative stabilization in character of output.

CHAPTER XXIX

GEOGRAPHICAL DISTRIBUTION

It has been the common experience of industries connected more or less intimately with our primary needs, that they should at first be distributed fairly widely over the settled area of a country, and later, when conditions become more stable, that they should tend to localize in certain regions. While this was true in times past even of the older nations of Europe, the process has been particularly clear in the United States with regard to certain industries. The westward movement of the frontier, which carried these industries along with it and spread them through the country, was a peculiarly American factor in scattering the establishments, and dominated the situation for a long time. Only slowly did the countermovement develop. This broad distribution and subsequent concentration may be remarked in the history of flour milling, meat packing, and even iron working in the United States, — though, to be sure, still later changes in economic conditions, especially of transportation and of markets, have sometimes occasioned a further readjustment of affairs, have broken into the accomplished localization, and built up comparatively new centers. Accordingly, the experience of the wool manufacture in this regard is of general interest as one aspect of American economic history. What has happened to the rather widely scattered industry of 1870? To what extent has industrial maturity brought changes similar to those in other manufactures? But the modifications of geographical distribution have a further and special interest. Concentration of manufacture within a given area tends usually toward the development of larger individual units of production. Has this basis for large-scale operations been given the American wool manufacture?



AN AUTOMATIC FEED AND FIRST BOWL OF A MODERN SCOURING MACHINE

Let us first confine our attention to the woolen branch of the industry. Here we find surprising changes to have occurred within the last half century. By the *Census of 1870* it appears that there were woolen mills in thirty-eight of the states and territories of the United States as then constituted. In fact, every state except Nebraska and Nevada was credited with one or more such establishments. By 1919, however, after a fairly steady movement, there remained mills in only twenty-nine states, — and the total number of states had of course now increased; and of these twenty-nine, only eighteen possessed more than five establishments. But the change is even more strikingly indicated by the following tabulation showing the respective ratios of mills, sets of cards, and woolen spindles by geographical sections in 1869 and in 1919:

DISTRIBUTION OF THE WOOLEN INDUSTRY BY SECTIONS

1869	New England	Central Atlantic (N. Y., N. J., and Pa.)	All Other
By number of establishments . . .	21.0	25.5	53.5
By sets of cards	40.1	26.8	33.1
By number of spindles	56.1	27.2	16.7
1919			
By number of establishments . . .	51.2	24.8	24.0
By sets of cards	60.3	27.6	12.1
By number of spindles	58.4 *	23.5	18.1

* Exclusive of Vermont.

Obviously, there has come a marked concentration of manufacture in the New England states. The statistics from which the above ratios were derived, themselves show many startling changes in absolute quantities. Thus, the total number of establishments in the West and South fell from 1546 in 1869 to 151 in 1919, although in the same period the corresponding figure for New England shrank only from 607 to 270. The radical decrease in the former figures, together with a very considerable drop in numbers and in proportions of woolen sets, may be attributed to the disappearance in the western and southern areas of those small mills largely, if not mainly, dependent upon custom carding (for the household manufacture), which had characterized the manu-

facture in such regions during the preceding period.¹ To this feature may also be assigned the small increase in the ratio of woolen spindles in the outlying states: the remaining mills have become chiefly establishments fully equipped for the production of yarns and fabrics.²

Yet the localization of the industry may be examined in another light, that is, by type of production. Such evidence as is available suggests that the great mass of finer fabrics, the outer-wear goods for the large and growing urban population, comes chiefly from the eastern concerns. The Census figures of production point in this direction. Thus, of the total quantity of all-wool woolen suitings, overcoatings, and dress-goods produced in the United States in 1919, over 90 per cent came from the New England and central Atlantic states (as above defined), minus Vermont with its seventeen mills. Again, an inspection of a textile directory reveals the same situation. In such states as Minnesota, Tennessee, or Oregon, the mills are represented as devoted chiefly to the production of such goods as blankets, flannels, mackinaw-cloth, jeans, and woolen yarns for the knitting trade.³ Thus, in a second and equally important

¹ The detailed figures may be of interest and are here presented:

1869	New England	Central Atlantic	All Other
		(N. Y., N. J. and Pa.)	
No. of establishments	607	738	1,546
No. of sets	3,358	2,243	2,765
No. of spindles	1,036,400	502,900	308,200
<hr/>			
1919			
No. of establishments	270	139	151
No. of sets	3,520	1,612	703
No. of spindles	1,233,300*	497,300	380,300

* Exclusive of Vermont.

² Another basis of measuring geographical distribution is that of the number of wage-earners. This basis is subject to the fault that it does not take into account varying efficiency of workmen, due to relative improvements in machinery or other causes. However, for purposes of record, the ratios upon this basis are presented:

	New England *	Central Atlantic	All Other
1869	51.2	28.3	20.5
1919	60.8	19.0	20.2

* Exclusive of Vermont.

³ In illustration the data upon the mills in Minnesota may be presented. It is a thoroughly typical list, rather higher in the matter of average size of establishment

manner, the woolen manufacture is characterized by industrial localization.

Finally, one should note in passing that the eastern states are the location of most of the larger wool-working establishments. The Assabet Mills of the American Woolen Company, at Maynard, Massachusetts, with its 145 sets of cards and 55,000 woolen spindles, is far and away the largest plant devoted solely to woolen fabrics that exists in the country, and, undoubtedly, that exists in the world; but there are many concerns in the East that contain twenty sets and greater. For example, the five mills in Pittsfield, Massachusetts, have an average of nineteen sets apiece. Furthermore, in the Census figures we may find the same story. By the statistics of 1919, it appears that the average number of sets per establishment in New England was 12.3, whereas for the western and southern states the corresponding figure was 4.6. In terms of spindles, the quantities were, respectively, 4560 spindles and 3660 spindles.¹ Fairly large woolen plants are occasionally to be found in the West, but not so frequently as in the East.

The information conveyed by the *Official American Textile Directory* for 1922 is as follows:

Location	No. of Sets	Type of Product
Bemidji	1	Hosiery, Yarns, and Woolen Goods.
Cambridge	2	Wool Batts and Knitting Yarns.
Duluth	11	Flannels, Mackinaw Cloth, Blankets, Yarns, Trouserings, Coatings, etc.
Faribault	7	Blankets, Uniform Flannel.
Fergus Falls	2	Blankets, Flannels, Mackinaws, Yarns.
Litchfield	2	Batting.
Litchfield	2	Blankets, Flannels, Mackinaws.
Minneapolis	16	Blankets.
St. Cloud	2	Knitting Yarns, Blankets, Flannels, Mackinaw Coats and Pants, Shawls.
St. Peter	1	Knitting Yarns.
Spring Grove	1	Knitting Yarns and Wool Batting.
Taylor's Falls	2	Wool Mattresses, Batting and Rolls.

(Wool batting is a term applied to the loose carded wool prepared at the power-driven mill for home spinning and weaving and for the filling of quilts. It is doubtful if this work figures high nowadays, even in the mills for which batting is reported.)

¹ The size of the average establishment in New England, Central Atlantic, and all other states in 1869 and in 1919, measured in terms both of cards and of spindles, was as follows:

1869	New England	Central Atlantic (N. Y., N. J., and Pa.)	All Others
Sets per establishment	5.5	3.0	1.8
Spindles per establishment	1700	680	190
1919			
Sets per establishment	12.3	11.6	4.6
Spindles per establishment	4560	3570	3660

found in the West, such as the North Star Mills at Minneapolis, Minnesota (sixteen sets) or the Portland Woolen Mills, of Portland, Oregon (fourteen sets); but they are quite the exception. The ordinary establishment is a two to five-set enterprise, working chiefly on knitting yarns, or upon fabrics of simple construction that are suitable for the local markets or that can be turned out effectively and cheaply enough to stand shipment east.¹

Let us now turn to the younger branch of the industry, the manufacture of worsted fabrics. Here we find a substantial contrast. Despite the movement toward greater localization in the woolen manufacture during the last fifty years, that branch is as yet considerably scattered as compared with the worsted section. According to the latest figures available, the six leading woolen states contained 73.5 per cent of the total spindlage of the country, while the similar group of worsted states held as much as 93.7 per cent of the worsted spindlage. Moreover, within the several states there is an important further localization. Such cities as Lawrence, Providence, Philadelphia, Passaic, and Jamestown (New York), with their outlying districts, stand out dominantly in the worsted production of their several communities. In some instances such cities probably turn out more than half the total production of the state within which they lie.² In general, one

¹ An inquiry as long ago as 1880 into the production of ninety-one western mills showed the production then to have consisted largely of blankets, flannels, yarns, etc., — the goods produced so considerably today. However, fancy cassimeres are mentioned three times, cassimeres nineteen times, beavers twice, doeskins and ladies' suitings once, beside jeans, tweeds, satinets, and linseys (*Bulletin*, 1880, pp. 185-186). Obviously, fabrics of "eastern" type, if we may use the expression, were commonly made in the West at that period. In fact, though the evidence is too meager to prove the case, I am inclined to believe the manufacture of such goods as cassimeres and the like have decreased relatively in the West during the period under discussion: that the production is concentrated in the eastern states to a greater degree than fifty years ago. A comment made in the report of the above inquiry is to the effect that western enterprises could not compete with the eastern mills in anything containing a substantial style quality. While eastern makers shift styles more or less each season, "in the majority of our western woolen mills, the same old styles of a quarter of a century ago are turned out, year after year, without the change of a thread or a check" (*ibid.*, p. 188).

² See some special figures presented by Weld from the *Census of 1910; Quarterly Journal of Economics*, xxvii, 71.

may conclude that the industry is concentrated geographically in an exceptional degree, — indeed, in a degree which, as far as the textile manufactures are concerned, is approached only by the silk industry.¹

But this situation in the worsted manufacture is of long standing. When the industry was first introduced into the United States, it was attracted to the older textile centers; and in 1870 was, in fact, more highly localized than in later decades. At that time approximately 90 per cent of the total spindleage reported was to be found in only three states: Massachusetts, Rhode Island, and Pennsylvania. In 1919, in the same states, still the leading ones in spindleage, the ratio was only 73.6 per cent. To some extent this decline with respect to these states has been accompanied by a general spread of the manufacture through the country. Whereas only eleven states were credited with worsted establishments in 1869 — and some of them doubtfully — by 1919 one or more mills are reported in as many as nineteen states. The greater part of this dissemination has occurred since 1904, during which time the proportion of spindles outside the leading states has increased rather faster than the general total.² But the chief cause of the above-mentioned decrease in ratio for Massachusetts, Rhode Island, and Pennsylvania has been the erection of important secondary centers in other communities, — principally New Jersey and New York. The introduction of the Continental system of worsted manufacture is partially responsible for these new developments, and the comparatively full absorption of the labor supply in the older communities has likewise played a part. Still, as already indicated, the shifts in location have not proceeded far enough to change in an essential way the characteristic concentration of the industry that it has

¹ The proportion of cotton spindles contained in the six leading states according to the *Census of 1919* was 80.3 per cent; of knitting machines of all types, 74.2 per cent; and of silk spindles, 93.5 per cent.

² For the states outside the leading six, the proportion in spindleage has increased between 1904 and 1919 from 4.8 to 6.3 per cent.

The distribution of the industry outside the leading communities is rather wide. In terms of establishments, it is as follows: Connecticut 9, Maine 7, Wisconsin 3, Ohio 3, and one each in Delaware, Georgia, Illinois, Kentucky, Oregon, South Carolina, Texas, Vermont, and West Virginia.

always possessed in this country. It remains a highly localized manufacture.¹

As far as location is concerned, then, the wool manufacture as a whole is in a position for more efficient operation than at the commencement of the present period. It is closer to the big wool markets of Boston and Philadelphia; it is near the builders of textile machinery and the manufacturers of mill supplies; and it can tap the large general labor supply of the eastern states, while, furthermore, the large consuming centers of the country are at its doors. Although the degree of gain secured by increased localization cannot of course be measured, we cannot doubt that it has been any the less real. Nor does there seem any strong likelihood of a further change in this regard for the immediate future. Possibly with a settling down of freight rates into a structure based more closely upon distance, — a probable result of intensified government regulation or of future government ownership, — or with the substantial filling up of the interior of the country and the consequent shift in market conditions, the West may acquire more mills, and mills of increasing size. For the present we seem to have reached a stable condition, or at least one that changes but slowly.

¹ By geographical divisions, the distribution of the worsted manufacture in 1869 and 1919 was as follows, on the basis of the number of employees:

	New England*	Central Atlantic (N. Y., N. J., and Pa.)	All Others
1869	65.0	34.0	1.0
1919	64.9	31.8	3.3

* Exclusive of Vermont.

Obviously, judged by this analysis, the industry has made no considerable change in the half century.

CHAPTER XXX

DIFFERENTIATION

THE increased differentiation of the wool manufacture may probably be taken as an indication of the greater maturity of that industry, no less than the increased localization with which it is somewhat connected. Surely, in the older industrial countries of Europe, this process of differentiation has been carried further than it has in the United States. There are doubtful features, to be sure. Fortuitous events, or at least developments unrelated to industrial maturity, have played a considerable part both in Europe and in this country. And then there are features connected more directly with the industrial maturity of other industries, rather than with that of the wool manufacture proper. However, I am inclined to think that in the particular case with which we are concerned the contention first made holds true.¹

Let us turn our attention first to the development of a differentiated wool-yarn spinning industry. Here we may at once note that among the fortuitous events related to the American development is the early rise of separate spinning and weaving establishments in and about Philadelphia. The textile industries of that region, it has been suggested, "have been derived more directly from the original models of Flemish and English industry, and have been transplanted more decidedly in the character of migrations than the like industries elsewhere in the United States."² Perhaps, too, the early advent of a distinct knitting

¹ This opinion is strengthened by the conclusions of Professor Weld, who some years ago wrote a highly interesting and valuable article upon "Specialization in the Woolen and Worsted Industry" (*Quarterly Journal of Economics*, 1912-1913, pp. 67-94). He divides the causes of differentiation into three groups, — technical, commercial, and historical. The first, with which we are now alone concerned, he interprets as "the extent of the market, homogeneity of product, and proximity of plants to each other" (p. 68), — all of which are surely phases of industrial maturity.

² *Bulletin*, 1880, p. 17. The long dominance of hand-loom weaving in this district may be cited as evidence supporting this view. See above, Vol. I, pp. 125, 225.

manufacture may have been an influence, since that encouraged a special development of spinning mills. Possibly the peculiar local environment was even more important, "a compact network of manufacturing establishments, all within hailing distance of each other," and particularly establishments which used cotton and wool rather indiscriminately.¹ Whatever the causes, the development in the Philadelphia district was unquestionably unique. In 1880, according to the Census of that year, Pennsylvania (and that meant chiefly the Philadelphia area) was producing approximately 75 per cent of the woolen yarns and almost 50 per cent of the worsted yarns that were manufactured for sale in the United States. Nor has this distinctive character been wholly lost in later years. By the figures of 1919, Pennsylvania's ratio of woolen yarns, including merino, produced for sale was over 60 per cent of the total, although the proportion in the worsted end had fallen to 25 per cent. But there is another way of looking at the matter. Pennsylvania mills purchased 43 per cent of the woolen and merino yarn that they employed and 70 per cent of the worsted yarn that they used; whereas for the country as a whole the proportions were 11 and 41 per cent, respectively. In addition, recent years have seen the establishment of several specialized wool-scouring and wool-combing plants in the Philadelphia district, while the development of differentiated dyeing plants for the treatment of wool goods has gone further there than in other sections of the country.²

¹ *Tops*, p. 23. The article in the *Bulletin* just quoted states: "Almost every mill and every weaver or knitter works cotton and wool both, and changes from one to the other with the season" (*Bulletin*, 1880, p. 17).

In addition to the factors above mentioned, there may be added the concentration of carpet manufacture in the Philadelphia region,—many of the carpet mills being wholly or partially dependent on outside wool-spinning establishments for their yarns,—and the migration of much cotton-cloth production from Philadelphia to the South in the eighties and nineties. In the latter case, many weaving mills that had previously bought and worked up cotton yarns now turned to the purchase and use of wool yarns.

² In 1912 it was said that "Philadelphia is primarily the dyeing center for woolen and worsted yarns in this country today. There is only one large dyeing plant in the East for eastern mills to send their yarns to, while the same is true in the state of New York. Moreover, there are only three or four knitting mills in this country which have their own dyeing plants" (*American Wool and Cotton Reporter*, 1912,

But other factors of a fortuitous or at least casual sort have had important influence in the general American development. Such was the introduction of worsted coatings. The serious competition of these fabrics with the preëstablished woolen-cloth production, together with the technical consideration that they could be woven on the same looms as fancy cassimeres, led many woolen manufacturers to take on the fabrication of these goods, at least as a side-line in their operations. Rather than throw out their old spinning machinery, such mill-men were glad to purchase their worsted yarns in the open market. At the Centennial Exposition of 1876, "one of the most conspicuous displays," said Mr. Hayes, was that of the United Spinners' Association of Philadelphia, comprising eight distinct concerns, devoted almost exclusively "to making Merino combing-wool worsteds (worsted yarn) for worsted coatings."¹ And the continued growth of the worsted manufacture tended to increase the volume of such goods produced for this purpose. So also the introduction of the French worsted system and the growing demand for fabrics in the production of which French worsted yarns were necessary led to the addition of yet greater capacity in the specialized worsted-spinning industry. Moreover, with the increased diversity of fabric production, and especially with the enhancement of the style feature as the quality of domestic cloth production advanced, went a more frequent mixing of several types of yarn in individual cloths. There is a tendency, asserts Cherington, for plants producing staple fabrics to integrate, but "the mills making fabrics in which the style element is large have every inducement to specialize."² In this movement of recent decades, woolen and worsted threads were combined in a single all-wool fabric. Silk yarn was introduced in the manufacture of fine worsteds. And greater variety in the use of cotton yarns arose: they were twisted with woolen or, more often, with worsted yarns in order to add strength to the latter, or to supply a given effect in the finished p. 836). The situation has not changed essentially in the intervening period. Similarly, the largest single dye-works for woolen and worsted fabrics is located in Philadelphia.

¹ Hayes, *Report on the Exhibition of 1876*, p. 45. See also *Bulletin*, 1877, p. 112.

² *The Wool Industry*, p. 105.

fabric; and they were employed occasionally as filling, although earlier they had found service only as warp threads. Such varied use of yarns made less necessary a mill's possession of the yarn-preparatory processes, or, perhaps better, it reduced the disadvantages of a mill not equipped with spinning apparatus. If one must buy some yarns, why not buy all?

Thirdly, among the casual influences playing upon the wool manufacture may be instanced the rise of the carpet and knit-goods industries. The carpet industry before the Civil War had been a rather small affair. In 1860 the Census reported 6,681 employees, and products valued at \$7,860,000, divided among 213 separate establishments, — or 33 wage-earners and a \$3700 annual turnover per establishment. The manufacture, however, was greatly stimulated by technical improvements in the sixties and seventies, especially the invention of the Skinner-Smith Axminster loom; while since then it has grown rapidly. On the other hand, the knit-goods industry, although in elementary form dating back even further than the carpet manufacture, experienced marked expansion later than did the carpet production. Here, too, it may be noted, improvements in machinery played a large part, — notably, as far as wool-yarn consumption is concerned, the advances in apparatus for the production of under-wear fabric. The effects of these developments are evident in the increase of yarns purchased by them (Figures 25 and 26). The importance of the carpet and of the knit-goods manufactures, respectively (ignoring other consumers of wool yarns for the moment) in making a market for such goods obviously has not been the same in the case of worsted as in that of woolen yarns. In worsted yarns, the purchases of the knit-goods mills have steadily increased in volume until in 1914 they passed those of the carpet manufacture. On the other hand, the carpet mills have taken by far the largest weight of woolen yarns brought to market, even though the share of the knitting trade has somewhat increased, especially in the last fifteen years.

The tariff also had a rôle in the general movement. By the act of 1883 the rates on wool yarns were much reduced by a cut in compensatory duties. In the act of 1867 this specific portion

of the rate had run from 20 cents to 50 cents a pound according to the value of the goods; now it was made to run from 10 to 35 cents per pound. Imports reacted promptly. Whereas in the

Millions of pounds

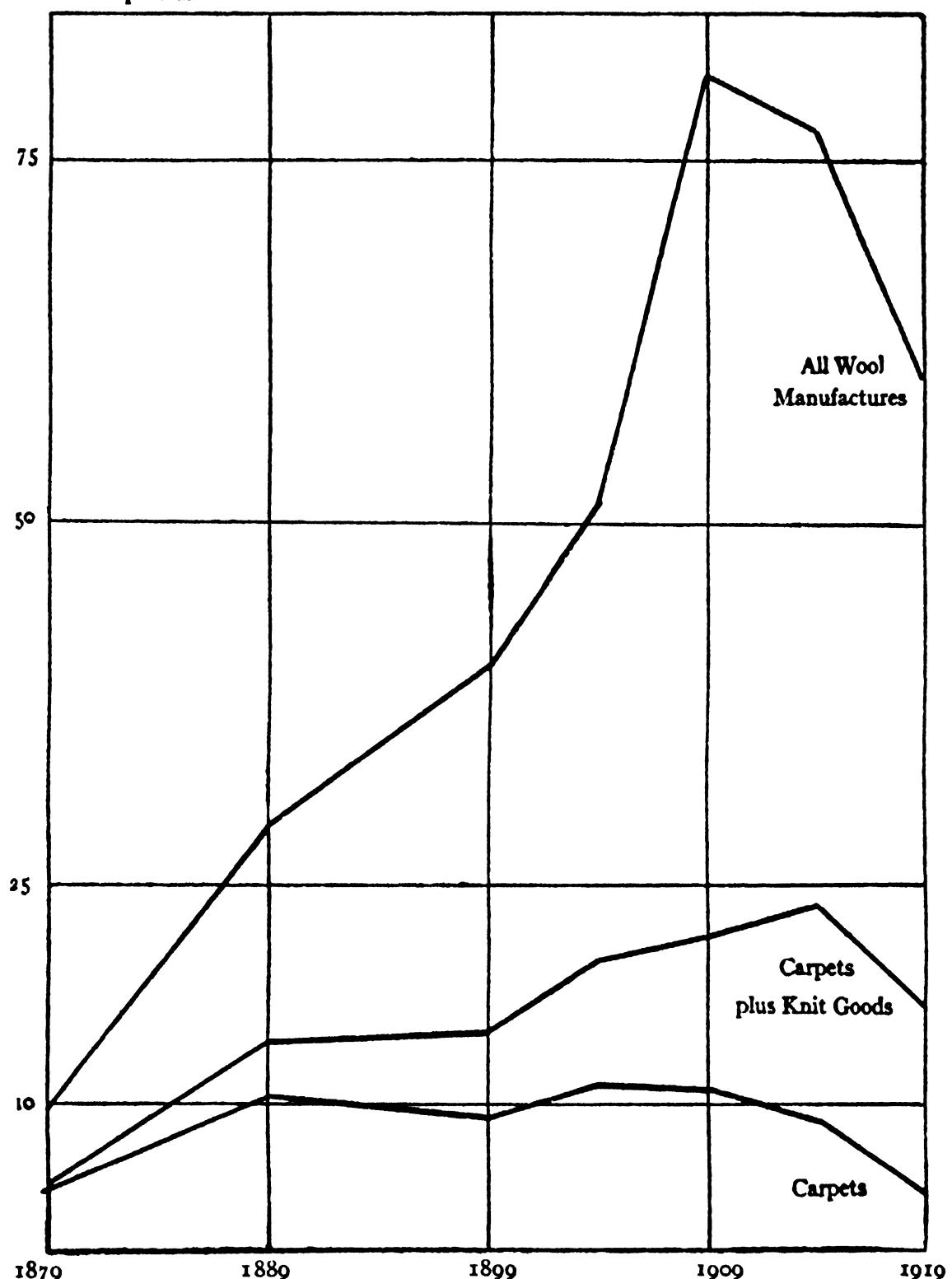


FIG. 25. Purchases of Worsted Yarn (in terms of quantity) by Carpet, Knit-goods, and All Wool Manufactures, 1879-1919.

preceding decade the inward movement of wool yarns had averaged less than half a million pounds, it advanced during the maintenance of the act of 1883 to an average of nearly three million pounds (2,840,000 pounds). Again, in the regime of the

Wilson act, imports ran high,—over 2 million pounds per annum. Such facilitated access to foreign supplies of yarns undoubtedly had some effect upon the structure of the domestic industry: an opportunity was opened with the erection of higher

Millions of pounds.

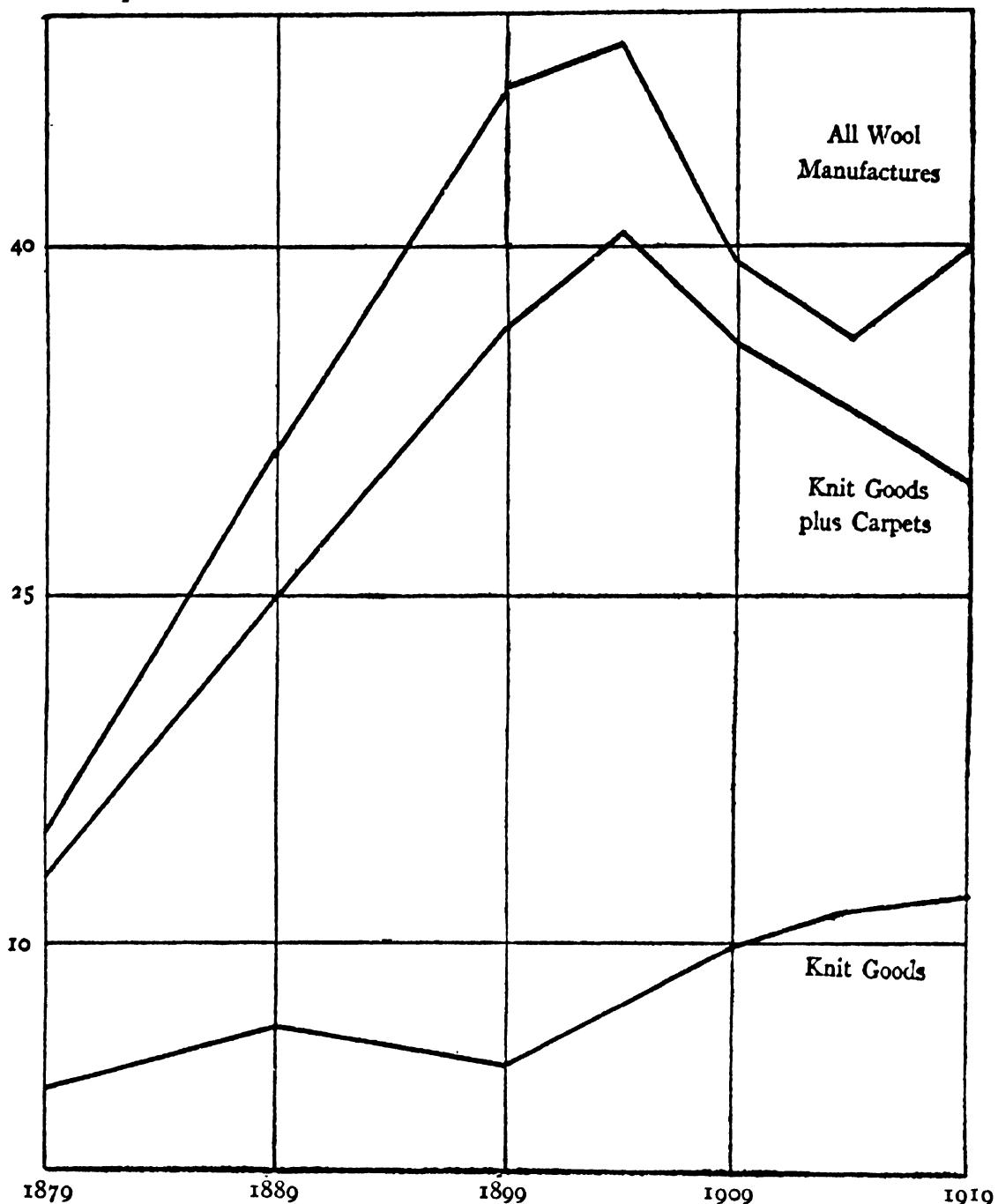


FIG. 26. Purchases of Woolen Yarns (in terms of quantity) by Knit-goods, Carpet, and All Wool Manufactures, 1879-1919.

duties for the establishment of differentiated spinning mills to supply the goods formerly purchased abroad. Moreover, since the importations were chiefly worsted yarns,¹ it was to be anticipated that the domestic worsted manufacture would be more affected than the woolen branch. On account of its intermittent

¹ See above, p. 55.

character, however, this tariff factor is of uncertain real influence. Probably it must be put down as in action largely supplementary to the domestic factors already discussed.

Lastly, though by no means of least importance, certain technical or semi-technical factors should be noted, — factors which, pertaining to the nature of wool-yarn production, played a rather passive part in encouraging or discouraging the trend toward differentiation. Chief among them is the difference in the character of worsted and of woolen yarn. As we have had occasion to note already, the worsted yarn is more homogeneous, and presents greater opportunity for standardization than does the woolen article. Wherefore, technical factors favor special yarn production in the one line and do not in the other.¹

The final result of all these forces may be observed in the volume of yarns purchased by the whole wool manufacture, and in the proportion between the quantity of yarns purchased and the total volume of yarns employed in the woolen and worsted-cloth manufactures. As to the former, it appears (Figures 25 and 26) that in every case an increase over corresponding figures for 1879 has been registered. The output of woolen yarns almost doubled between 1879 and 1904, but since then, due chiefly to changes in the carpet and knit-goods industries, the production has declined

¹ Something of the technical difficulties standing in the way of the woolen-yarn manufacture may be gathered from the following: "While the making of sale worsted yarn is a well established business, it is not the same with wool (meaning woolen) yarn, where the quality of the raw stock and its manipulation make designation and discernment of distinct qualities more difficult, and hence less satisfactory. Therefore, although it is quite customary for one concern to do carding and spinning for another, the latter almost invariably supplies the raw material, and in most cases it is in the prepared state. This way of doing is often unsatisfactory, and usually only resorted to in emergencies, when the weaving part of the home mill is in advance of the yarn-making part" (*American Wool and Cotton Reporter*, June 5, 1919, p. 1900).

In addition may be noted the customary practices in the woolen branch of dyeing the wool while it is still loose (i. e., before carding and spinning), and the employment of yarns colored in great variety. The latter is occasioned by the part played in much woolen-cloth production of the color scheme as the fundamental feature of design. One consequence is that a mill often uses small lots of specific colored yarns; and this situation makes disadvantageous any dependence upon outside sources for yarn supplies.

See also Weld, *op. cit.*, pp. 86-89; and *Tops*, p. 24.

appreciably. By the returns of the 1919 Census, it appears that the output now is only 40 per cent greater than in 1879. The worsted-yarn manufacture has advanced much more rapidly, although, to be sure, it started on a lower base. This production was in 1909 nearly eight-fold that of 1879, and it still is well above six-fold the earlier quantity. This production, too, has reached a volume which in the last decade or so has run substantially higher — 100 to 175 per cent higher — than the output of woolen yarn.

Of special interest, however, is the further point: the ratio in the wool-cloth manufacture of wool-yarns purchased to total wool-yarns consumed. Differentiation has increased, obviously, and that is an important feature of the existing wool-manufacturing industry; but has it affected the wool-cloth production particularly? A glance at the charts just presented (Figures 25 and 26) suggests the answer. In the case of woolen yarns, the carpet and knit-goods manufactures have played the chief rôles; the quantity purchased by the cloth manufacture (the difference between total purchases and those of carpet and knit-goods manufactures combined) has been small. Indeed, as other recent Census data show, the proportion of such yarns purchased to the total employed in the production of wool-cloths has lately been less than 5 per cent. On the other hand, not only has the cloth manufacture grown steadily as a purchaser of worsted yarns, but the ratio of such "boughten" yarns to the total worsted yarns consumed has increased. In recent years this ratio has been around 40 to 42 per cent.¹

¹ The volume of woolen and of worsted yarns produced for sale in the wool-cloth manufactures has been as follows:

Year	WOOLEN YARNS *		WORSTED YARNS †	
	Quantity (lbs.)	Index Number (1879=100)	Quantity (lbs.)	Index Number (1879=100)
1879	27,122,000	100.0	11,888,000	100.0
1889	40,852,000	150.6	27,437,000	280.3
1899	48,674,000	179.4	43,003,000	361.7
1904	51,702,000	190.6	58,790,000	494.5
1909	38,770,000	142.9	92,086,000	774.6
1914	32,599,000	120.1	90,461,000	760.9
1919	37,537,000	138.4	78,554,000	660.7

* Including all merino yarns until 1899, and subsequently all yarns entered as woolen-merino.

† Including worsted-merino yarns after 1899.

We may note incidentally that the carpet and knit-goods industries proper pro-

Consideration of historical development and of current conditions leads to certain general conclusions. First, specialization in the worsted-yarn manufacture has proceeded substantially further than in the woolen-yarn branch. The absolute volumes of the two productions for sale and the ratios between yarns bought and yarns consumed both attest this fact. The specialized production of woolen yarns, because of the earlier establishment of the woolen branch in this country, was greater at the commencement of our present period, 1870; but the advance in subsequent decades has been much more rapid in the case of the worsted-yarn industry. Commercial and technical factors of wide influence have given greatest impetus to the worsted development, whereas the expansion of the outside consuming industries, especially the carpet trade, has been the chief stimulus in woolen-yarn manufacture.

Secondly, for the production of woolen and worsted fabrics, which is the field of our special interest, the specialized worsted-yarn manufacture has been of much greater importance than has that of woolen yarns. Here the greater diversity in structure of woolen yarns as compared with worsted yarns comes into play, as well as the historical influence of the later evolution in the American worsted-cloth manufacture. On the whole, the yarns used in the production of woolen cloths are almost sure to be wrought up in the mills employing them, whereas the yarns going into worsted fabrics are nearly as likely to come from outside the mills consuming them as to be spun within their walls.

Finally, there seems to be no great prospect of a considerable change in the degree of specialization within the wool manufacture as a whole, nor within the woolen and worsted-cloth manufactures themselves. The quantity of wool yarns, both woolen and worsted, produced for their own consumption in the

vide only 50 to 60 per cent of their requirements of woolen and worsted yarns, except worsted yarn for the knit-goods trade, where the proportion is peculiarly small. According to the latest figures available (those for 1919), the carpet manufacture produced 61 per cent of the woolen yarns which it consumed, and 57 per cent of the worsted yarns. Corresponding figures for the knit-goods manufacture were 52 and 4 per cent, respectively, the former figure in this case including merino yarns.

carpet and knit-goods mills has not changed markedly in recent years, and there is no prospect of change which would affect the supply demanded of the woolen or worsted industries proper. The volume of woolen yarns produced for sale by the wool-fabric manufactures has grown in recent years, while that of worsted yarn has declined; but these changes may be explained on the basis of the change in popularity of woolen goods. There appears no underlying reason for an expansion in woolen-yarn production as a more or less permanent affair. Even in the worsted-yarn manufacture, there is no reason to expect a noteworthy modification of present conditions. The fact that production of such yarns for sale ceased to advance but instead fell off sharply between 1909 and 1919 is significant: possibly the trend toward differentiation has stopped.¹ Moreover, because of the close relationship between differentiation and the degree of style influence in cloth production, the considerable extent to which stability apparently has been attained in the quality of the latter production is also significant.² The example of European industries, to be sure, argues to the contrary: that we shall follow them in greater differentiation. Yet on account of the greater standardization in American cloth production and of the larger size of representative manufacturing unit in the United States, such action seems doubtful. If change comes to the domestic yarn production, it will be of gradual action and probably not considerable.

It is time, however, to give consideration to other lines of differentiation in the wool manufacture. These are primarily the separation of wool-scouring and of top-making from the general body of the wool-manufacturing industry. The origin of the former is obscure. Possibly it dates back to the time when mesti^o wools of exceptionally heavy shrinkage were largely used in the domestic manufacture, and to the days of relatively high transportation costs before the Civil War. Mr. Hayes, on the

¹ The decline in total purchases (Figure 25) was greater than that by the carpet and knit-goods industries taken alone.

² See above, pp. 174 ff.

other hand, speaks of the distinct branch of wool-scouring as having developed between 1859 and 1879, though with error he includes specialized spinning also as a war-time or post-war development.¹ At least, by 1899 wool-scouring was recognized as an established branch of the wool manufacture, at that time containing twenty-five concerns. Since then, with only a minor increase in the number of establishments, from twenty-five to thirty-three, the business has grown in scope and importance. This is indicated by the advance in number of employees from 720 to 2177, as well as by the steady rise in the "value added by manufacture." The increase was particularly great between 1914 and 1919.² However, despite the substantial absolute advance in scope during recent decades, the distinct wool-scouring branch is still no considerable feature of the whole wool manufacture, nor does it seem likely to expand materially in the future.

The difficulties standing in the way of the distinct wool-scouring industry are partly technical and partly sentimental. Let us get the actual situation in mind. There are a few scouring plants on the Pacific coast, e. g., San Francisco and Stockton, California, and several in Chicago connected with wool-pulling, but the greater number are in eastern centers of wool-trading. The patrons of such establishments, especially of the latter, are wool merchants and to some extent wool manufacturers, for whom the

¹ *Bulletin*, 1879, p. 281. At this time Mr. Hayes recognized the phenomenon of increasing specialization throughout the industry, — scouring, spinning, weaving, and finishing, — "a system ensuring greater perfection of work, and permitting the embarking in manufacture of workmen with moderate capital, and whose success is nowhere in this country so well illustrated as in Philadelphia."

² The number of wage-earners employed doubled in this period. The enhancement in value of products and of value added by manufacture was of course considerably greater on account of the decline in the value of the dollar. For purposes of reference, however, it may be stated that the value added by manufacture rose from \$696,000 in 1899 to \$1,389,000 in 1914 and to \$6,451,000 in 1919, — an increase of nearly ten-fold.

No figures are obtainable as to the quantity of wool treated at these separate scouring plants; nor are those figures valuable which the Department of Commerce has been collecting as to the consumption of wool in the domestic manufacture. Apparently, these latter include under the heading "scoured wool," wool scoured in the mill where consumed as well as wool purchased in the scoured condition.

scouring mills work upon the commission basis.¹ The chief advantage as far as the Coast plants are concerned lies in the saving of freight charges: freight is not paid upon dirt and grease, which sometimes comprises 60 per cent or more of the wool in the natural state; and that feature may frequently counterbalance the higher freight rate on the scoured material. For the eastern and Chicago scouring mills, the business comes as a mere incident to wool-dealing. Wool manufacturers often find it desirable to purchase wool which has already been scoured. If they buy wool in the grease, some portions of the fleeces will prove unsuited to their purposes. Therefore, the wool merchant or wool puller frequently will sort and scour the wool prior to sale, thereby permitting the manufacturers to purchase only those "sorts" that fit their particular needs.² But, by and large, the only manufacturers who will tolerate this manner of trading are makers of woolen goods. Scoured wool has a tendency to mat when packed for shipment, and in the manufacturing operations matted wool is believed to break its staple. For the woolen man this feature is of no great moment: saving in shipping charges or convenience in buying may well offset the loss in average staple length. To the worsted manufacturer, on the other hand, length of staple is a prime consideration. Other things being equal, the longer the average length of staple, the greater will be the yield of tops to a given weight of wool, and the stronger will be his yarn. The latter, of course, means easier weaving, better appearance of the cloth, etc. That scoured wool in fact will mat sufficiently to make a real difference in top-yield, and so to affect the results in yarn

¹ Thus, in 1914, the amounts received by wool-scouring mills for commission work was \$1,324,355, although their total "value added by manufacture" (which included the amount received for commission work) was only \$1,388,974. Similar data for 1919 are not available.

Some wool-scouring is done by mills devoted more particularly to other aims, e. g., wool-combing plants; but apparently most of the wool-scouring mills do nothing else, unless perhaps some wool-carbonizing (the chemical elimination of vegetable matter) which is a somewhat similar operation.

² There seems to be no reason other than habit why wool-sorting should be accompanied by wool-scouring in these cases. The wool must be unpacked and handled over, of course, in the sorting operation. Possibly scouring was originally added because it could just as well be done after the wool was loosened; and there was a saving in freight.

and cloth, has never, to my knowledge, been scientifically proved. However, opinion in the trade is quite unanimous that the matting of scoured wool is really a serious matter; and perhaps the test of experience is adequate.¹ Anyway, the prejudice exists and must be reckoned with. While it does obtain, there is little likelihood of a considerable extension of wool-scouring as a separate industry. This obviously must be true when we consider that those most concerned with possible deterioration through matting, the worsted manufacturers, are by far the heaviest purchasers of raw wool in the country.²

As to wool-combing, the story is much different. This separation is of distinctly recent origin. Curiously enough, it came in the generally dark days of the Wilson act, although the project was matured slightly earlier. The Arlington Mills, of Lawrence, Massachusetts, after examination of foreign practice, — for differentiated wool-combing is almost universal abroad, — began running its combing machinery night and day during the latter part of 1894 and practically all of 1895. It found that considerable quantities of tops, the excess of the Company's own needs, could be sold advantageously in the open market. Then a new mill particularly for the manufacture of tops was determined upon and built; and since then the Arlington Mills have been one of the leading top-makers in the country.³ Meanwhile, the Wilson tariff, with its plain 20 per cent ad valorem duty upon tops, had facilitated an increased importation of these goods. From a negligible quantity under previous acts, foreign purchases rose to over $5\frac{1}{2}$ million pounds in 1897. Perhaps this importation created an American market for tops through the readjustments of the worsted industry made during those years of low duties. At least it indicated that a market existed for tops offered upon a proper price basis. With the example of Arlington Mills as encouragement, a beginning in commission combing was made by

¹ There is at least a risk of breakage if the wool is matted in an extraordinary degree; and from this risk the manufacturer is free if he scours his own wool.

² See above, p. 71, for the relative wool consumption of the woolen and worsted manufactures.

³ *Tops*, a booklet published by the Arlington Mills, pp. 21-22.

other concerns; and after practically prohibitive rates on tops were again imposed, the growth of the domestic top manufacture continued.¹

The expansion of the differentiated domestic manufacture of tops is best reflected in the statistics of tops purchased by the whole American wool-manufacturing industry. From a figure of almost exactly 6 million pounds in 1899, this trade had increased nearly five-fold by 1914. With the return to popularity of woolen fabrics, the volume of output fell slightly in 1919, but still amounted to $26\frac{1}{2}$ million pounds.² During the same period, the number of wool-combing establishments increased from two or three in 1899 to ten or a dozen whose sole or main purpose is the production of tops, and a half-dozen other concerns, like the Arlington Mills, which combine combing for the trade with their other activities.³ The proportion of tops purchased for use in the worsted yarn and cloth manufactures has grown to something like fifteen per cent of the total quantity of tops consumed in the

¹ The radical increase at this time (1897) of top duties was the occasion of an outburst at a subsequent tariff revision (1909) against Mr. William Whitman (see p. 23, above), who was interested in "tops, yarns, dress-goods." Neither the wool manufacturers' association nor Mr. Whitman seem to have thought of the perfectly sound argument against low duties on tops, which the organization of the worsted manufacture in America suggested. The American industry was chiefly an integrated one; at least, it was at that time without any considerable split at the top stage. To have permitted a large importation of tops would have been tantamount to causing the scrapping of the top-preparing departments of American mills,—of course, in more or less degree. "Competitive" tariff rates may perhaps be best limited to those semi-manufactured products which have a substantial open market within the protected country.

² The Census statistics of tops produced in the wool manufacture seem quite unsatisfactory. Thus, in 1909 when there probably was little or no importation of tops (in 1912 and 1913 imports were only 283 and 512 pounds, respectively), the quantity of tops produced for sale was reported as 11,321,000 pounds, while that of tops purchased was 21,103,000 pounds.

³ In addition there are some integrated yarn and cloth-making mills that for various reasons turn out a certain amount of tops without giving special emphasis to this line of work: because the market for tops is at an advantageous point, because the mills are anxious to unload a portion of their wool stocks, because they desire to keep their preparatory departments occupied, or for some other reason. On the whole, however, the production of such firms probably does not bulk large in comparison with the total domestic top output for sale or on commission.

worsted industry, i. e., including tops made in the mills wherein they are used.¹ This manufacture of tops, it may be added, is carried through largely upon the commission basis, the combers working for wool dealers and (to a less extent) for wool manufacturers; although in recent years and especially in the Boston district some wool dealers have established top-manufacturing departments, and now sell a large proportion of their goods in the form of tops and noils.² The product, in any event, finds its employment almost exclusively in the worsted-cloth fabrication.

The future of the top-producing branch of the industry is problematical. The previous growth in this country may indicate that there are distinct economies in differentiation; and the European experience perhaps may be taken to argue even more strongly in this direction. Then, too, the fact that tops may be standardized to a certain degree, — a degree sufficient for fairly ready marketing, — and the relatively high cost of building a combined combing-spinning mill, establishes technical factors favorable to further development along the line already started.³ On the other hand, however, the manufacture of tops here has been pretty well limited to certain grades of product, chiefly the crossbred varieties, since manufacturers of fine yarns and cloths usually possess sufficient combing machinery for their own needs. And the trend of our worsted industry as a whole has been toward a larger production of the finer qualities of finished product. Moreover, there has not yet come the establishment of merchant top-makers in the European style, i. e., men who buy

¹ This proportion is secured by using the scoured equivalent of wool consumed in the worsted-goods industry, the ratio of top-yield from scoured wool according to an average given by the Tariff Board (*Report*, p. 622), and the quantity of tops purchased by worsted mills. Exact ratios are 14.5 in 1914 and 14.6 in 1919.

² Warburg, *Wool and Wool Manufacture*, p. 45.

³ There are no generally accepted standards of tops, any more than there have been, until the adoption of the government qualities, generally accepted standards of wools. Each top-manufacturer sets up his own standards, and tries (if he be honest) to live up to them. But it has been noticed both here and abroad that in periods of rising prices for wool the qualities of tops tend to suffer: a 60s top is not quite the same article as perhaps a year ago, and surely not that of two or three years before.

wool of the wool dealers, have it combed on commission, and sell the completed tops. In a way, one may say, top-making has not become a distinct trade. The work in this country is carried on in connection with wool-dealing or at the order of wool merchants and wool manufacturers. Finally, it may be noted that in the last five years 1914-1919 there has been no sensible increase in the proportion of tops purchased by worsted mills as compared with their total consumption (tops purchased and made): in both years the ratio was slightly less than 15 per cent. The generally disrupting and upsetting years of the war brought no change. Possibly the differentiation of top-making has proceeded as far in this country as it will for some time to come, under the existing organization of the trade and under the economic conditions of the country.¹

¹ Something might be included in this chapter concerning the wool-pulling industry. However, this seems too intimately connected with wool production to find proper place in a study of the wool manufacture.

Again, there are a few mills in the country, especially in the Philadelphia district, that weave on commission, maintaining no other sections of the manufacture. These, however, were too few and inconsequential as compared with the whole wool manufacture to deserve serious consideration. There has been no development of a differentiated weaving industry as there has been a separation of wool spinning. Substantially the same may be said of separate dyeing concerns, although the number is here somewhat greater than in the case of commission weavers.

Commission work, it may be noted in passing, does not as yet bulk large in the American wool manufacture, although scouring, combing, spinning, weaving, dyeing, and finishing are all to some extent done on this method. Statistics on "contract work" as reported by the Census are as follows:

	Worsted Mills	Woolen Mills	Scouring Mills *
1899	\$793,000	\$775,000	\$696,000
1904	445,000	744,000	838,000
1909	2,461,000	565,000	1,167,000
1914	2,867,000	579,000	1,389,000
1919	13,628,000	4,758,000	6,451,000

* Value added by manufacture in independent scouring establishments.

The extraordinary increase in value of contract work in 1919 is only in part explained by the rise in charges due to changes in the value of money. Perhaps, however, it is due to conditions peculiar to that year.

The Census reports forty-seven establishments in the wool manufacture as dyeing, bleaching, or printing woolen and worsted goods "for others," and 124 establishments as doing custom spinning or weaving. These must generally be small concerns, or concerns that take in work only at rare intervals, since commission work is not the common thing in the domestic manufacture.

There remains only the necessity of noting briefly the development of an industry closely allied to the wool manufacture, the production of recovered wool fiber. This industry, it will be remembered, was just expanding in 1870 with the increased use of "shoddy" in the American woolen-cloth production. Indeed, from 1860 on to 1890, the scale of operations in shoddy-making grew rapidly, the number of employees, for example, doubling every decade.¹ Between 1890 and 1910 there was some reaction, perhaps accompanied by an extension of shoddy-making in the woolen mills themselves; but subsequently expansion of the independent shoddy manufacture was resumed, until today it is larger than ever before.

The production of shoddy in the recent past was shared in about equal proportions between the shoddy industry proper and the mills which used the fiber. Thus in 1909 and 1914 the quantity yielded by the former was 53 to 54 per cent of the total. But according to the 1919 figures, a substantial change in these proportions had occurred during the period of the war. At the later date about 75 per cent had come to be made up in the shoddy industry. Whether this marks a permanent change in the division of shoddy production cannot yet be determined. It may possibly be a passing phase occasioned indirectly by the increased importations of wool substitutes in the years immediately following the war. At least, there is no indication that the distinct shoddy industry is declining in importance. Rather, the underlying forces seem to favor an expansion of the distinct shoddy industry. Mills devoted solely to the production of shoddy are able frequently to turn out a better grade of article from given material than the woolen mill, for which the operation is a minor affair, to turn it out more cheaply, and especially to grade and classify the product in such manner that woolen mills may readily purchase just the qualities of recovered fiber that they need. Undoubtedly, then, the shoddy manufacture has an established place in the shade of the wool

¹ The number of wage-earners increased thus: 1860, 290; 1870, 632; 1880, 1282; and 1890, 2155. Thereafter this number oscillated between 2155 and 1923, until 1920 when it rose to 2566.

manufacture, and a place which may yet expand somewhat in the future.

In summary, the fact should be emphasized that differentiation has become a significant feature of the wool-manufacturing development in the period 1870-1920. Most outstanding has been the development of the separate spinning industry, but of importance also has been the rise of top fabrication and the considerable expansion of the wool-scouring and shoddy-manufacturing branches. Attention must also be given the fact that the movement of differentiation has affected mainly the worsted branch of the industry. Differentiated wool-scouring and shoddy-making, to be sure, are of importance chiefly to the woolen branch, and there are woolen-yarn spinning establishments for the manufacture of knitting and carpet yarns. However, none of these sub-divisions of the general wool-working industry has even yet attained any large dimensions; and, besides, the first two are chiefly concerned with preparation of the raw material. The distinct top-making manufacture and the extensive worsted-yarn manufacture exceed both in scope and significance the activities affecting the woolen industry.

Yet were the question asked, — “Is the American wool manufacture a differentiated or integrated affair?” one must still reply that, on the whole, it was integrated. Surely this would be the case were the woolen branch alone the basis of inquiry. In 1909, 89.3 per cent of all the spindles in the woolen manufacture and 98.1 per cent of all the looms were in establishments which carried through all the processes of woolen-cloth production. For the worsted branch, however, the response would perforce be less decisive. At the most recent time when such figures were available, 1909, the proportion of combing machines, spindles, and looms contained in mills which carried through the whole worsted process were respectively 61.3, 57.0, and 61.4, — say, about 60 per cent of the machinery.¹ And neither in the course of top and

¹ The proportion of such integrated establishments to the total number in the worsted manufacture was much lower than its proportion of machinery: 13.9 per cent. Even in the woolen branch, the integrated concerns formed only 76.6 per

of worsted-yarn production during the succeeding decade, nor in any other pertinent material, is there suggestion that there has been appreciable alteration in these proportions. Accordingly, we may conclude that, by and large, the wool manufacture still retains its characteristic older organization, although in sections the system has materially changed.

Note on Specialization.

Specialization, or the devotion of an establishment to a single type and quality of product, is not a characteristic feature of the wool manufacture. To be sure, there are mills, say, in the woolen branch which produce blankets only, or flannels, or carpet yarns; but there is considerable range in quality and type of such goods. Occasionally one finds a mill of really close-drawn field of operation: such, for example, as the Ballardvale Mills Company, concentrated upon the fabrication of superfine flannels alone; but these concerns are rare. In the worsted branch the cases are run upon more frequently than in the woolen. A worsted spinning plant producing a single count of yarn, said the Tariff Board, does not exist, "although there are mills which closely approximate to it in that the range of quality which they produce is very slight."¹ Occasionally a mill will turn out a meager range of serges or cotton-warp dress-goods. On the whole, however, the specialization is of the limited type spoken of above, while perhaps more generally the scope of production is wide indeed. The normal worsted-suiting or worsted dress-goods mill yields fabrics of diverse weaves, qualities, finishes, and designs. Within its output may be a number of fabrics which it produces year after year and in considerable volume relative to its total manufacture; but it will carry with its "staples" a line of "fancies," — and the "fancies" spell diversity. Only a large organization such as the American Woolen Company can carry specialization to any particular length; and its cent of the industry. In general, the establishments carrying the full operation were larger in average size than the differentiated enterprises.

The statistics above quoted are drawn from the article by Weld, *op. cit.*, pp. 72-73.

¹ *Report on Schedule K*, p. 645.

“plant specialization” is mainly of the general type already specified.

The reasons for this situation lie deep in the nature of the wool manufacture, and are connected with those influences which have gone to restrict the essential strength of this manufacturing industry. For the present, I need indicate these factors but generally. There is the possibility extended by the character of the wool fiber, with its wide variations in quality and feel, tempting and encouraging the wool manufacturer to diversify his products. To this same end work the availability of introducing other materials, — carpet wool, shoddy, cotton, cotton warp, silk fiber, and the like, — and the wide diversity of finishes to which the worsted and especially the woolen fabric respond. Finally may be instanced the particularly great proportion of wool fabrics which are utilized as outer clothing. Here style is necessary in this day and generation; and style leads to “fancies” which, as already suggested, are obtainable only through diversity of production. The underwear-flannel mill of fifty years ago could run on a half-dozen varieties of that fabric, but when it was converted to a woman’s dress-goods mill, its “line” was multiplied many-fold. Such factors stand in the way of standardization in product, and no less strongly do they check the development of specialization in manufacture.¹

¹ See below, pp. 215-216.

CHAPTER XXXI

LARGE-SCALE OPERATION

THE chief characteristic of the wool manufacture in the recent period, as has already been commented, is the existence of large-scale production. This feature is less conspicuous in some parts of the industry than in others, but relative to the conditions that obtained fifty years ago, each branch of the manufacture has made prodigious strides. The discussion of wool supply, of the tariff, and of other factors in the period since 1870 has brought out important forces that have fostered this new development; and the survey of geographical distribution, differentiation, and the like has cleared the ground for an appreciation of certain qualifications and explanations of the general movement. What in fact has been the course of growth for the individual establishment in the years since 1870; and what may be ascertained as the underlying causes?

The general picture may best be gained perhaps by an inspection of the statistics covering the average number of wage-earners per establishment in the woolen and worsted branches by Census years since 1870. These figures are presented in the following tabulation:

	1869	1879	1889	1899	1904	1909	1914	1919
Woolen Mills	28	43	59	67	92	89	98	112
Worsted Mills	127	247	301	306	307	343	368	355

Three facts are outstanding. The progress in the woolen branch has been steadily forward, except for the period 1904-1909, toward a larger average unit of operation, whereas the similar development in the worsted manufacture has been less consistent. A plateau was reached by 1889; this was held until 1904; then came another advance, which terminated in 1914, and since that time has not been renewed. Again, the ratio of advance apparently has been much greater in the woolen than in the

worsted section. The increase in the former has been four-fold while the average worsted establishment has failed even to treble in size. Yet this picture does not really carry conviction. Averages frequently fail to tell the whole story; and in this case

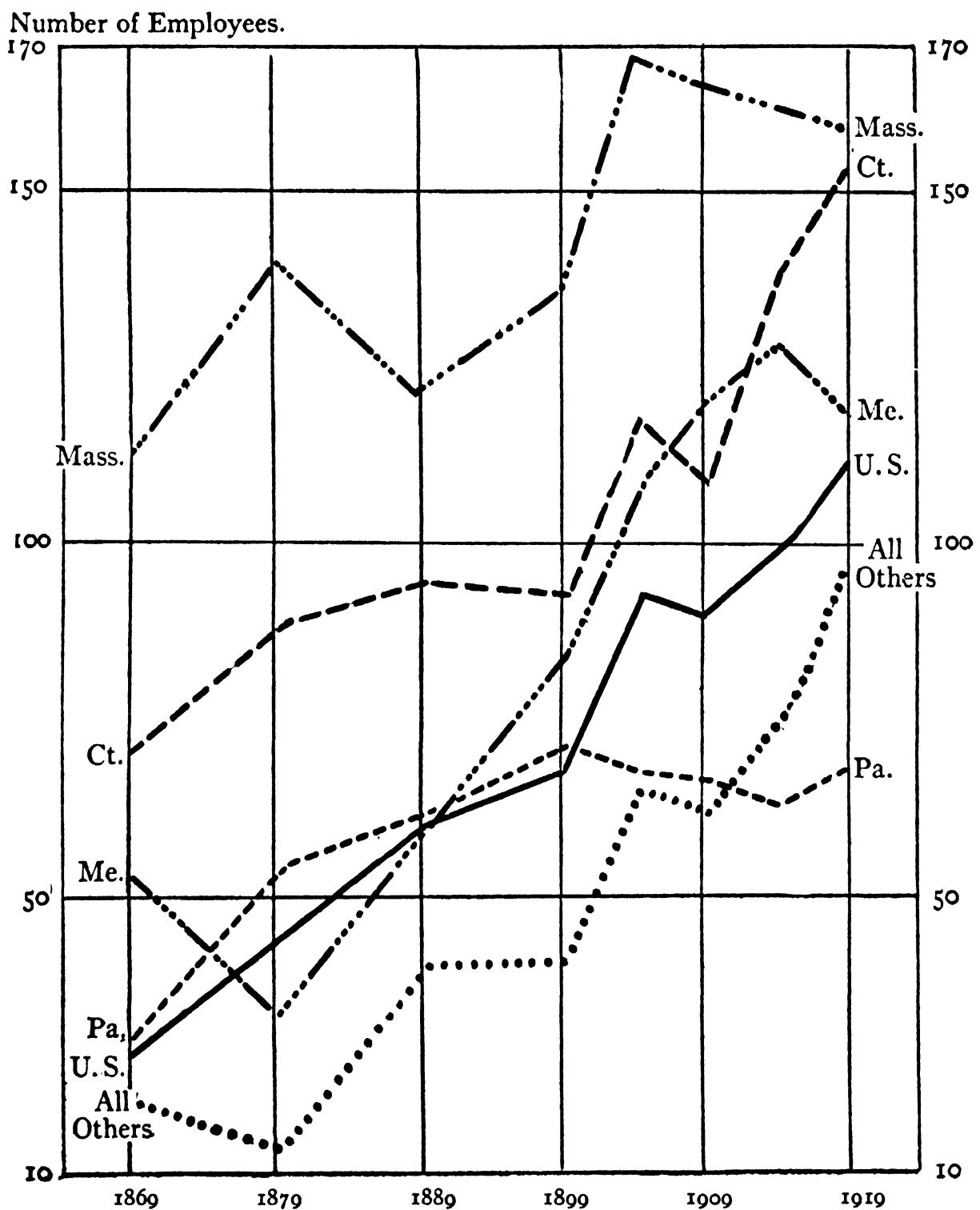


FIG. 27. Average Number of Wage-Earners per Woolen Mill in the States with Important Woolen-Cloth Manufactures, 1869-1919.

the particularly great magnitude of many worsted mills is well known. Surely such concerns must contrast sharply with any organization existent in 1870. Closer analysis should clear up the obvious discrepancy; and, incidentally, it may give some explanation of the irregularity of growth in the worsted section.

Let us first note, however, the third general fact: that the point in size of establishment reached by the woolen manufacture, even by the latest figures, falls far short of that attained by the worsted branch. In fact, it is less than that of the worsted industry at the commencement of the period under consideration.¹

The steady advance in size of average establishment in the woolen manufacture is to be explained chiefly by the increasing localization of the domestic woolen mills, with the concomitant dropping out of small western enterprises. It is evident from a comparison of the rate of progress in representative states (Figure 27) that in the eastern communities, e.g., Massachusetts, Pennsylvania, and Connecticut, the advance has been less rapid than for "all other" states or for the industry as a whole. The eastern mills held their own, and indeed made appreciable progress, while the small mills elsewhere in the country fell by the wayside; the whole American industry was, as it were, leveled up toward the eastern standard. As early as 1880, Mr. Bond made note of the tendency, giving some explanation of its causes; and, with the background that we now have of the industry at this period, including the effects which flowed from the spread of the worsted production, his account is particularly enlightening. "Of late years," he said, "the manufacture of woolen goods has been a very close business, and has required the best appliances and the closest attention to make it profitable.

¹ A picture of substantially the same features is derived from the statistics of average value of product per establishment in woolen and in worsted mills. The changes in the value of money make the figures less satisfactory, although on the other hand the data upon the number of employees, above presented, do not give expression to any advances in efficiency of production which took place during the half century. Unfortunately, adequate statistics of production on a quantity basis are not available.

For purposes of comparison, however, the data for average value of product per mill are presented. In the woolen branch, the average value rose from \$53,754 per establishment in 1869 to \$651,601 in 1919. In the sister manufacture, the corresponding values were \$216,571 and \$2,399,101, respectively. Statistics for the intervening Census dates are treated in the form of index numbers based upon 1869 as 100:

	1869	1879	1889	1899	1904	1909	1914	1919
Woolen Mills . . .	100	150.9	189.7	213.0	334.2	339.8	385.8	1213.4
Worsted Mills . . .	100	203.8	255.6	298.6	338.5	445.5	427.0	1107.6

Formerly, many small establishments were scattered over the country, mostly in the wool-growing regions, of which a large portion ran only a part of the year, with poor machinery, perhaps making several kinds of goods on the same sets of machinery;

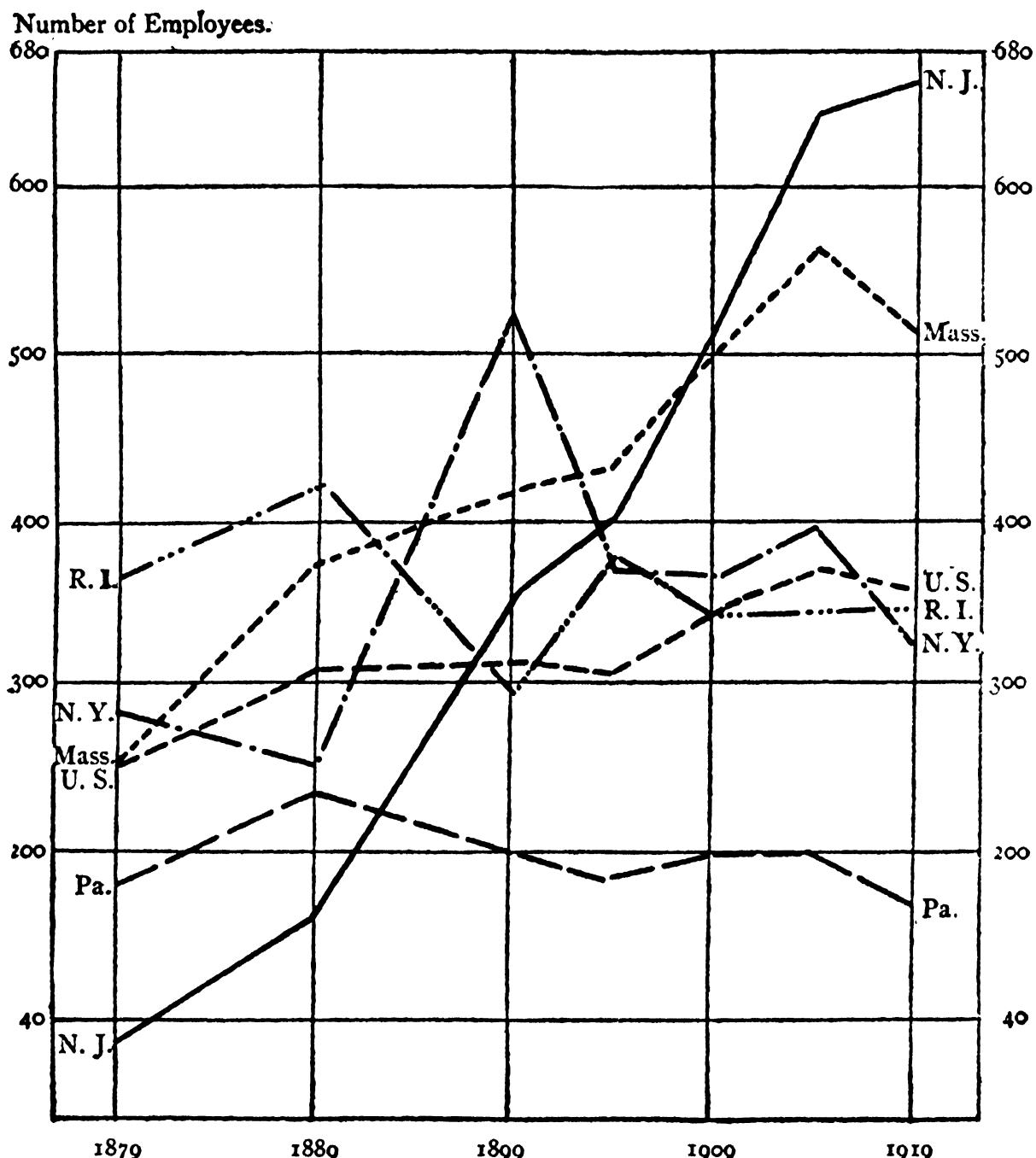


FIG. 28. Average Number of Wage-Earners per Worsted Mill in the States with Important Worsted-Cloth Manufactures, 1879-1919.

but these could not compete with well-appointed factories, devoted to their several specialties."¹ Competition of this sort, it may be added, has continued; and the result is to be found in the increased localization and enlarged unit of operation now encountered in the remaining woolen establishments.

¹ *Census of 1880, "Report on Wool Manufacture,"* p. 1.

Mr. Bond uses the word "specialties" in a broad sense: heavy woolens, worsted dress-goods, blankets, and the like.

On the other hand, the worsted development was not particularly affected by localization. To be sure, there has been greater advance in size of establishment in certain of the important eastern states, notably Massachusetts and New Jersey, than in others (Figure 28); but, as already indicated, the industry was well concentrated by 1870. More important an influence here is that of differentiation. To the increased activity in this direction may well be attributed the plateau after 1890, and the small variation in size between 1909 and 1919. At times, as in the years before 1889 and presumably between 1904 and 1914, the tendency toward larger operating units due to the general economies of such arrangements overcame the tendency toward smaller average units proceeding from the splitting up of the industrial process. The actual course of development in the two branches, then, is by no means fully exhibited by the statistics presented above.

Similar factors are concerned with the question of the relative degree of advance in the two branches of the industry, where the statistics indicate a much more rapid rise in the woolen end. It is notable, for example, that the situation in these branches was substantially different at the beginning of the period. The woolen mills had grown from carding-fulling shops or other humble origins, and, delayed by the westward movement of the industry, had even by 1870 taken on few characteristics of the modern organization in many parts of the country. Contrariwise, the worsted manufacture had been imported bodily from foreign soil, where it had already grown to a full-fledged factory system; and there was no "dead hand of past achievement," if we may use Veblen's phrase, to restrain a rapid acquisition of the most advantageous arrangements under existing economic conditions. Moreover, the general similarity of the technical processes to those of the preëxisting cotton manufacture, and the greater initial capital required for installation of a worsted mill, gave an impetus to large-scale operation in the early stages of introduction. With such diverse conditions in the two industries at the beginning of the modern era, and with differentiation making progress chiefly in the worsted manufacture, there is no

mystery in the more rapid growth in *average* size of woolen establishment. The case is substantially different if we compare the size of *typical* woolen and worsted mills of the two periods, 1870 and the present day. The representative woolen mill has grown in size, to be sure, but more striking has been the increase in scale of operation of the integrated worsted "manufactory," — but of this more, shortly.¹

The third point among the conclusions above suggested, that of the relative stage reached in the two industries, opens up for discussion the whole field of comparative commercial and technical conditions in these manufactures.² But first certain factors which favor large-scale operation in either branch of the industry should be noted. For example, concerns of extensive activities making a diversity of fabrics can afford to maintain wool-buying departments that will purchase directly from the wool grower, or from the local wool merchant in the growing areas. Their varied productions will use up all the different grades of staple secured from whole fleeces, whereas a smaller mill with a more limited range of fabrication would be compelled to dispose of a considerable portion of the wool acquired in such fashion as "off-sorts." Thereby a saving in merchants' profit may be secured. Again, the large concern can purchase raw material in larger blocks, gaining the advantage of the wool merchant's

¹ See below, pp. 217-220.

² Another view of the comparative position of the woolen and worsted manufactures with respect to scale of producing units may be secured from the statistics of distribution of mills in such manufactures according to the number of employees each contains. From these figures, it appears that only approximately 9 per cent of woolen establishments in 1919 had 251 or more wage-earners; whereas 35 per cent of the worsted mills contained that number. However, it may be noted that the increase in proportion of the larger establishments was greater for the woolen branch in the period for which we have the figures, 1909-1919, than for the worsted industry:

	Woolen Goods			Worsted Goods		
	1909	1914	1919	1909	1914	1919
100 wage-earners or less . . .	68.8	65.2	58.5	39.4	36.9	36.9
101-250	23.2	28.1	31.4	29.9	27.2	28.0
251-500	4.9	5.6	8.9	15.8	20.8	17.8
501-1000	*	*	*	8.7	6.7	8.6
Over 1000	*	*	*	6.2	8.4	8.6

* Less than 1 per cent.

best price; while its financial position may enable it better to take up all trade discounts. In times when rising wool prices are expected, it can afford to resort to the speculative policy of buying wool "on the sheep's back." In the actual manufacturing operations the larger enterprise has a good chance of securing a higher quality of managerial ability, and of technical skill in its superintendents and foremen. The prizes in the case of a large organization are bound to be greater than in a smaller one, and able men are likely to be attracted to its ranks. Finally, in selling, not only are economies possible, but mere bulk of operation has advantages, that is, if accompanied by some diversification. Such a concern can handle the largest order that is likely to be proffered; it can afford to carry staples in considerable stock; and with a substantial variety of types and styles of products, it gains business, just as the department store secures advantages in retail trade from similar factors. Economies come from the institution of direct selling, a feature commented upon already, from the better management of the sales force, from the lower overhead per unit of product, and from better position to enforce sales contracts even in a broken market.

To be sure, not all factors conduce to the advantage of large-scale operations. The labor supply is not infrequently a source of inconvenience and sometimes of actual discomfort. Occasionally the supply in a given locality is entirely absorbed, — or nearly so. In some cases, as when the American Woolen Company opened its mammoth Wood Mill at Lawrence, the management finds it difficult for a time to secure enough help to man a new equipment of machines; and, in other cases, as in that of the Cleveland Worsted Company, new sites for additional large plants must be sought. Then, too, large units of operation, and especially the aggregation of several large units in a single city, facilitate the formation of labor organizations, — a feature to which the troubles at Lawrence give evidence.

Another factor inimical to large-scale enterprises is high quality in production. Generally speaking, the higher the quality of the production, the greater must be the amount of the individual attention bestowed upon the manufacturing operations

by the responsible heads as well as by the employees of the concern. The effect of this circumstance is particularly patent in the manufacture of men's-wear fabrics. To be sure, there exists manufacture upon a truly large scale of standardized or semi-standardized worsted cloths which as far as the quality of the raw material and of workmanship is concerned would be characterized as fine fabrics. Goods of this order are turned out by the furlong, if not by the mile, at establishments such as the Fulton, Wanskuck, and Arlington Mills.¹ In the production of comparable cloths, however, where the style element is also a feature,—and this covers the larger portion of the fine men's-wear cloth manufacture,—representative plants are of distinctly moderate size. This is true whether they are producing woolen, worsted, or both woolen and worsted fabrics. Such, for example, are the Hockanum Mills at Rockville, Connecticut, or the Mabbett plant at Plymouth, Massachusetts, enterprises well known in the American trade for their fine woolen and worsted cloths. The mills of the former average around one hundred looms, and the latter establishment contains only fifty-eight looms.

In the manufacture of fine dress-goods, something of a contradictory situation exists. Some of the mills turning out the highest-grade fabrics are large integrated concerns. The cases of the Forstmann-Huffmann enterprise, the Arlington Mills, and the Pacific Mills may be cited. To some extent the explanation of their large unit size lies in the combination of medium, standardized production with their operations upon fine goods. Thus, the Arlington Mills turns out tops, yarns, and "staple" fabrics, as well as a substantial proportion of highest quality dress-goods. But a full explanation must also take the wholesale clothing industry for women's-wear garments into account.² That branch

¹ In these cases as well as generally through the industry, the production of the finer goods is combined in the same establishment with the manufacture of lower-quality fabrics. Mills specializing upon the production of high-grade standardized men's-wear cloths are rare, if indeed they exist at all. Perhaps the joint manufacture of fine and of other goods assists in the prosecution of the former upon a sizable scale.

² The tariff as a condition of this manufacture, though not a cause of it, should not be forgotten.

of the clothing industry has captured the trade in women's garments to an appreciably greater degree than the men's-wear end has covered its proper territory, in extent and especially in quality of fabrics demanded.¹ Since the clothing industry generally desires appreciable quantities of uniform fabrics as well as a considerable range of types and qualities, it bestows an advantage on the large dress-goods concern. Peculiar conditions, then, particularly the wide domestic market and the special requirements of the cutting-up trade, make possible the exception to the general rule that high quality and large-scale production are incompatible.²

The smaller scale of operations in the woolen branch, to proceed again with the main argument, is in part the result of historical accident, — the earlier development of the woolen industry in this country and its subsequent wider spread through the states. Mills, once established, developed local reputations and local markets, from which they have not been dislodged. By reason of cheap power, special markets, and equipment that was long since and cheaply acquired, they have been able to maintain themselves despite the competition of the better organized and technically more efficient rivals. But there are conditions inherent in the woolen manufacture which support this tenacity; for, it should be observed, the difference in scope of

¹ See above, pp. 138-140.

² Professor Barker (*op. cit.*, p. 187) made an interesting comment after his visit to the United States in the summer of 1919: "We in Britain have the idea that America can produce rough and ready cloths in bulk and that we at home are superior in producing the finest fabrics the trade demands. I was, therefore, somewhat surprised at Passaic to find a firm employing some 5000 work-people and producing finer, better finished dress fabrics than Bradford has yet produced. And before I left New York, I was shewn Worsted Fabrics which it was impossible to exceed in beauty of texture and colour. Generally speaking, American factories are engaged on turning out good average cloths in bulk: but America does already produce the finest possible woollen and worsted fabrics for men's and women's wear and she can produce these in bulk whenever she so desires." Professor Barker was, I believe, in error in including without qualification men's-wear with women's-wear goods, as I have already indicated. Otherwise, his statement is particularly noteworthy.

I would add that a general large-scale production of high-grade fabrics in the men's-wear section of the worsted industry may come in the future. As yet, however, this has not come to pass.

operations is roughly the same in all wool-manufacturing countries.¹ The production of woolen yarns and the finishing of woolen fabrics require special attention from an expert, responsible executive. The mixing of the various grades of raw wool, wastes, shoddy, and cotton to attain the best possible stock for the price, and the best possible resultant yarn, demands the care and skill of a master. This feature is reflected in the position of the boss-carder. His is one of the key positions in the woolen mill. In the English woolen organizations, where he seems to have greater responsibility, he is considered the aristocrat of the whole labor force. Again, the attainment of the right degree and right type of finish in the goods, after the treatment in fulling, gigging, shearing, tentering, pressing, and the like, cannot be left to the chances of a large organization. Then, too, the greater importance of designing in the woolen branch, with its manifold materials and its multitude of possible effects, puts a premium upon the work of a small mill. A small mill may be as successful in guessing the right trend of fashion as the larger one; and the detail of supervision seems better suited to the former. It has been said of the designing for fine woolens that a designer can effectively care only for a mill of about a hundred looms. If he tries styling for a larger establishment, he begins repeating, like the minister after his first hundred sermons. All these factors, it may be observed, are closely related to the matter of standardization in production; and, as has been stated before, woolen cloths can be standardized to a much smaller degree than worsted fabrics. That, with what influence past events may have had on the present situation, is the nub of the whole matter. The increase in size of operating unit in recent years is traceable in part to the advance in such standardization among woolen goods; but the movement has not proceeded far in this manufacture.

The situation in the worsted manufacture is chiefly the obverse

¹ Clapham, pp. 131 ff. It appears from Clapham's discussion that in England "a woolen mill which contains both spinning and weaving departments, employs as a rule only about half as many hands as a worsted mill that only spins, and about two-thirds as many as a worsted mill that only weaves,"—and such is the normal organization of British woolen and worsted mills (pp. 132-133).

of the considerations above, and they need no considerable comment. Certain other factors, however, should be noted. The greater amount of capital required for the establishment of worsted-cloth production has in the past acted as a check upon the erection of small concerns. In a way the historical element has been the direct opposite of that in the woolen branch. Production began with the sizable, integrated mill. Not until differentiation had made progress in the worsted industry did the smaller mill put in an appearance; and even here the force of standardization in products has sometimes tended to give advantage to the larger differentiated concern. Again, the technical similarity of the worsted with the cotton manufacture has tended to lead the newer enterprises in the footsteps of the older, which almost from its establishment moved in the direction of larger units.¹ Perhaps it is no accident that the number of employees per establishment in the worsted and cotton manufactures should be so nearly identical: 355 in the worsted industry, according to the *Census of 1920*, and 334 in the cotton. In short, the launching of the worsted manufacture took place under conditions favorable to large-scale operations, and technical factors have tended generally to maintain this feature.

The difference in scale of operation between the woolen and worsted industries is best explained from a theoretical point of view by Professor Dewing's "law of balanced return:" "That the point at which the law of diminishing returns begins to operate as the scale of production is increased, is determined by the ratio between the labor costs and the capital costs." By reason of the technical skill and the considerable care necessary in the manufacture of woolen fabrics, the law of diminishing returns sets in early. On the other hand, in the case of worsted

¹ From a beginning as modest as that of the woolen manufacture, the average size of cotton-manufacturing establishment grew rapidly. The number of wage-earners per establishment in 1831 was 78; by 1859, 231; and by 1899, 306. Thereafter there was a period of hesitation, a plateau, caused largely by the tendency toward differentiation; but in the decade 1909 to 1919 the movement recommenced, the figure in 1919 reaching 334.

The carpet industry, too, has displayed a trend toward large-scale operation. Here the influence of particularly great equipment, and the large capital required for its acquisition, has played an important part.

goods, capital investment in machinery may be substituted for skilled labor, and the point at which diminishing returns become evident may be postponed.¹ One may conclude, then, that while technical conditions remain as they are at present, there is little likelihood that any marked change should occur in the relative size of representative establishments in the two branches of the wool-working industry.²

Let us pause to note the extraordinary size to which individual and typical establishments in the wool manufacture have attained. In 1830 the representative mill was in modern eyes an

¹ Dewing, *Financial Policy of Corporations*, iv, 30. The whole of Chapter II in this volume is devoted to the law of balanced return. Professor Dewing (*ibid.*, pp. 27-29) indicates that in the cotton manufacture (to which the worsted manufacture has above been likened) is not adapted to large-scale operations: that the "medium-sized mill" gives all the economies to be secured from mere size of producing unit. I do not intend by my use of the term "large-scale operation" in connection with the worsted manufacture to suggest a disagreement with Professor Dewing's general statement as regards the worsted. He was comparing the cotton manufacture with other industrial lines such as iron and steel. I am thinking of the worsted industry in relation to the woolen. As will appear below, the experience of the American Woolen Company suggests that in the worsted branch as in the cotton manufacture there is no place for an indefinite expansion of manufacturing operation. A mill of "moderate size," at least as compared with some industrial plants, seems here also to be the most economical.

² Until recently the nature of mill ownership in the respective lines has also been symptomatic of the difference in the conditions of the two manufactures. Woolen mills usually started as the enterprises of individuals or partnerships, and in 1870 were undoubtedly still of that character in a predominant degree. Worsted establishments, however, frequently began as incorporated companies; or the worsted manufacture was taken on by enterprises otherwise principally engaged, which were already in the form of incorporated concerns. Cases of the Middlesex and Hamilton Woolen Companies, the Pacific Mills, and the Amoskeag Manufacturing Company come to mind. Even as late as 1899 the stamp of the earlier history is clear: approximately 45 per cent of the existing worsted mills were owned by incorporated companies, but scarcely 30 per cent of the woolen mills. The condition in 1899 and in subsequent decades is indicated in the following tabulation:

CHARACTER OF OWNERSHIP				Worsted Mills		
	Individual	Woolen Mills Corporation	All Other	Individual	Worsted Mills Corporation	All Other
1899	426	311	298	43	83	60
1909	152	307	128	42	226	56
1919	94	399	67	27	229	36

extremely modest concern, a set or two of woolen cards, a few hundred woolen spindles, and ten or a dozen narrow looms, if indeed the weaving process had been brought in under the cover of the mill. Forty years later, — if the scanty evidence available be trustworthy, — the corresponding enterprise had grown appreciably. Many small mills still existed, dispersed through the wool-growing states; but in the area where the industry had become a more mature affair, the typical establishment was perhaps a 6 to 8-set mill, with possibly 25 to 36 looms, these still of narrow reed-space. And what of the present time? Woolen mills have shown an appreciable growth. Now an establishment of 12 to 18 sets, or of 100 to 150 looms is not an uncommon matter. The woolen mills of Maine may be instanced. Of the 56 establishments listed in a recent textile directory as manufacturing woolen fabrics, all but 15 were 8-set establishments or larger, and 10 contained 15 sets or more.¹ The four woolen mills under the control of M. T. Stevens and Sons Company hold 10 to 18 sets and something like 130 broad looms apiece.² The 33 establishments of the American Woolen Company devoted chiefly to woolen-goods manufacture average between 18 and 19 sets and approximately 120 looms each, the Assabet Mill with its 128 sets and 760 looms towering above the rest. Even more startling data are available concerning the worsted industry. One may note the Lorraine Manufacturing Company with 570 broad and 430 narrow looms; the Forstmann & Huffmann Company with 1500 broad looms; and the Atlantic Mills with 2500 similar machines, — all these in the newer dress-goods manufacture.³ The worsted plants of the American Woolen Company engaged chiefly on worsted goods average over 525 broad looms apiece, with the Washington and Wood Mills much overtopping the others. The last plant deserves special mention not only as the largest wool-working establishment in the United States but also in the world.

¹ Information taken from the *Official American Textile Directory*, 1922, published by the *Textile World*.

² One of the mills contains some worsted machinery, and allowance has been made for that in taking an average of loom equipment.

³ The Pacific Mills may well have a yet larger equipment but I have not seen the specific figures in terms of looms.

Its equipment embraces 146 worsted combs, 210,000 worsted spindles, and 1500 broad looms.¹

In this development of larger manufacturing establishments, it may be observed, integrated concerns have acquired the greater size. They contain more than their proportion of machinery. This was made evident in a special investigation made by the Census for 1909, from the summary of which some data have already been presented.² Woolen mills in 1909 which carried on the whole manufacturing process, contained nearly 90 per cent of the total woolen spindleage in the industry and all but 2 per cent of the total number of looms, although forming scarcely three-quarters of the whole industry in terms of establishments. Similarly, integrated worsted mills, representing less than a sixth of the worsted manufacture on the latter basis, held about 60 per cent of worsted machinery. This evidence, to be sure, reflects the special influence which differentiation of manufacture had already had in the worsted industry; and the subsequent years have undoubtedly increased the disparity between the woolen and worsted branches. Yet at the present time the effect of the early development of large integrated concerns in the worsted manufacture would still be apparent in a set of similar figures: the concerns embracing the whole or nearly the whole manufacturing operation would be found to contain more than their proportion of operating equipment.

Summary. The feature of large-scale operation, then, is distinctive of the modern period. In the woolen branch this has meant appreciably larger establishments than existed forty years ago, though the representative woolen mill still lacks much of attaining the scope typical of the worsted mills in this country, — at any rate, the worsted enterprises of the integrated type. The prospect of marked advance in size of woolen mill, it may be added, is not bright. Previous American experience, experience in foreign wool manufactures, and analysis of the technical

¹ The data concerning the equipment of mills in the American Woolen Company have been taken from the publication by that Company entitled *American Woolen Company Mills*, published in 1921. For other concerns the *Official American Textile Directory*, 1922, has been used.

² See above, p. 206. For other material, see Weld, *op. cit.*, pp. 72-73.

and other conditions surrounding the woolen branch all suggest that woolen mills will never rival in size the establishments in the allied worsted manufacture. The woolen section seems to have settled down to a representative establishment of eight to twelve sets and 125 to 150 looms, and of course a mill of the integrated variety. Technical advance or the dropping out of small scattered mills may increase the average size of plant, but improvement in quality of output will tend to restrain any such enhancement. Something like stability has been attained, it seems, with production on a fairly large scale, considering the nature of the manufacture.

The growth of huge establishments in the worsted branch is equally characteristic of the period; and in that manufacture such establishments — being of the integrated type — maintain a particularly important position in the industry. Differentiation, to be sure, has introduced a new factor. But here manufacture in specialized spinning or weaving plants proceeds on a considerable scale, though hardly in scope comparable with the integrated type. A stopping place apparently has been reached, — or perhaps better a considerable pausing place. The figures for average size of worsted mill show no recent increase. The experiment of the Wood Mill has not been repeated by the American Woolen Company, the subsequent Ayer and Shawsheen Mills being substantially smaller than their predecessor. And the emphasis on quality production restricts the scope of the mill devoted to worsted-fabric manufacture. Differentiation may continue to grow for some time further, but that seems improbable on any large scale. Under the conditions of the American market for wool fabrics and especially with the support of considerable standardization, an advantage appears to rest with the integrated enterprise. Something of the present arrangements in the worsted industry seems likely to continue, i. e., a division of the field: the fabrication of standard products, including those of high grade, will remain chiefly under the control of large integrated concerns, while the diversified cloth production and the miscellaneous work such as the supply of yarn to the carpet and knit-goods trades will find useful the differentia-

tion of operations into independent establishments. Only with a marked change in the shares of standardized and diversified manufacture for the domestic market, or with a marked increase in the scope of these affiliated industries, will there likely be any substantial shift in the present situation. Probably the odds would favor a trend toward increased differentiation, but there is no immediate prospect that the rate of this movement will be at all great.

However, in one line connected with large-scale operations, conditions can hardly be accepted as substantially stable: the field of large-scale management. Here the situation is still in a state of flux. The large-scale units of production have been attained. Large-scale aggregations under single management are of recent origin, for the most part, and current events — e. g., the annexation of the Peacedale Manufacturing Company by the Stevens interest, and the absorption of the Slater mill by the American Woolen Company — imply that the process has not worked itself out. To this development we may now devote our attention, a development which by its peculiar significance deserves a separate chapter.

CHAPTER XXXII

LARGE-SCALE MANAGEMENT

A PARTICULARLY distinctive feature of the development in wool-manufacturing since the Civil War has been the rise of large-scale management. Fifty years ago the universal or practically universal unit of management in the industry was the single mill. Some indirect relations between mills existed through the intermediary of common selling agents, but individual ownership rarely extended beyond a single plant. With such a situation the existing combinations and consolidations among wool-working mills are in sharp contrast, and the trend seems set to carry the industry still further from the simple arrangements of 1870.

The movement toward large-scale management in the wool manufacture is also of interest because even the moderate success here attained contrasts rather markedly with the course of events in the allied cotton manufacture. At least three combinations in the latter industry have had rather unfortunate experiences, and no existing large-scale enterprise of similar character appears to promise an exception to the cases already examined.¹ On the other hand, we find at least two important instances of successful or fairly successful large-scale management in the wool-manufacturing industry, together with an adequate number of prosperous medium-sized organizations, to suggest that such good fortune as the more conspicuous concerns have enjoyed has not been wholly fortuitous. True there has been a combination in wool manufacturing which has had a less happy career; but certain conditions surrounding its experience indicate that this is something of a special case.²

Thirdly, there are features connected with the history of large-

¹ See Copeland, *Cotton Manufacturing Industry of the United States*, ch. xix, and Dewing, *Financial Policy of Corporations*, iv, 27 ff.

² In addition there has been a recent disaster in a medium-sized enterprise which combined some wool manufacturing with the production of wool garments. Such a mixed case may perhaps be ignored.

scale administration within the wool manufacture which are of value to the investigator especially concerned with the technique of the combination movement. The problem of large-scale management differs substantially from that of the large-scale operation of individual establishments. To be sure, some of the same factors play important rôles in both cases, but the contrasts are particularly noteworthy. The study of experience in the wool-manufacturing industry will, I think, bring to light suggestive material along these lines.

Let us first examine the cases of medium-sized concerns, — cases which are in some respects as important as the more outstanding instances of larger operations. With the growth of the wool manufacture within the last fifty years has come, as just suggested, the rise in goodly number of small groups of mills under individual managements. Some of these are groups owned or controlled by selling houses. Of these information is too meager to make description accurate. Other groups can be more satisfactorily presented. Such, for example, is that now held together by the firm of M. T. Stevens & Sons Company. The history in this instance goes back a considerable period. The original mill was that founded by Captain Nathaniel Stevens at North Andover, Massachusetts, in 1813, to which reference has frequently been made. As early as 1855 an additional plant, in Haverhill, Massachusetts, a dozen miles away, was purchased and equipped. Then followed the acquisition of mills in Franklin, New Hampshire, the old Marland Mill in Andover, and the Osgood Mill in North Andover, Massachusetts. In 1919, finally, the company assumed control of the large Peacedale establishment, itself a concern with a century's history. Thus, altogether, M. T. Stevens & Sons Company directs six mills, containing some seventy sets of woolen cards, a considerable amount of worsted spinning machinery, and over eight hundred broad looms. The mills are devoted largely to the production of woolen cloths and dress-goods, and represent good-sized plants for that sort of output.¹

¹ A description of the rise of the Stevens' enterprise is contained in *Bulletin*, 1907, p. 156.

Another consolidation deserving special notice is that supervised by the Hockanum Mills Company of Rockville, Connecticut. This comprises five plants all located in that town, and they are occupied mainly in the manufacture of woolen and worsted cloths of high quality. The capacities of these establishments are particularly noteworthy. The smallest is of 72 looms, the largest of 142, and the average exactly 98. Apparently the assertion above quoted, placing the desirable size of a fine-cloth mill at 100 looms — at least from the viewpoint of designing — finds basis in practice.¹

Passing over other aggregations of mills scattered through the country, on the Pacific coast, in the Philadelphia area, and in the mountains of Kentucky,² we may profitably survey at even greater length than in the previous cases the largest of all mere consolidations, the Cleveland Worsted Mills Company. A manufacturing concern of some years' standing, the Turner Worsted Company, was reincorporated in 1902 as the Cleveland Worsted Mills Company, and this new enterprise at once acquired, by cash purchase, four other plants, two in Ravenna, Ohio, and two in Philadelphia. To this nucleus have been added from time to time still other mills, until now it controls eleven establishments. While the largest single unit of the concern is at Cleveland, oddly enough there has been no success in securing mills near that city.³ Among the newer plants acquired outright or

¹ See above, p. 218.

² The groups of mills to which I have special reference are:

The Bishop interests in the Far West, comprising woolen mills in Pendleton, Oregon; Washougal, Washington; and Eureka, California; besides a knitting mill in Vancouver, Washington. The former are relatively small affairs, the largest being a six-set plant, and they turn out a diversified product, from blankets to cassimeres.

The Dobson mills in and about Philadelphia, five separate plants, two of 300-400 loom capacity, besides a large carpet and plush mill.

The American Textile Woolen Company, which has three small mills in Kentucky, Tennessee, and western Georgia, turning out low-grade goods chiefly but maintaining a selling agency in New York City.

The Daniel Boone Mills, a small combination of wool-cloth and wool-garment manufacture, with headquarters in Chicago.

³ The factor of inadequate labor supply is stated by the Company to have occasioned its expansion to regions other than the original one.

now under its control, two are in Falconer, New York, and two others in Providence, Rhode Island. At present its equipment includes approximately 185,000 worsted spindles and 1800 broad looms. This does not threaten the primacy of the American Woolen Company with its 460,000 worsted spindles, 290,000 woolen spindles, and 9800 looms. Still, it is a large unit for the worsted industry.

The Company is noteworthy in at least one regard, the extent to which it has carried differentiation among its several plants despite their geographical separation. Only two of its mills contain the whole series of processes, from scouring the raw wool to weaving the cloth. Other mills perform combing, vigoreaux printing, spinning, weaving, or finishing alone, or a combination of two of these stages in the worsted manufacture. It is noteworthy also because of its apparently steady earning capacity,—“apparent,” because little information is available concerning this aspect of the enterprise. Dividends of 7 per cent were regularly paid during the period 1902-1909, and 8 per cent thereafter through 1917.¹

The earning power of the Company and its general success are attributable, at least in considerable part, to two factors: the character of the management and that of the products. The dominant personality of the enlarged enterprise was Mr. George H. Hodgson, a man who had secured his early training in the British wool manufacture and who combined unusual technical knowledge with executive ability. He has been considered one of the ablest men in the American industry, and the expansion and success of the Company have been in a large measure the result of his guidance. But the second element has also been of much influence. The Company originally was devoted to the production of serges, one of the quasi-standardized fabrics of the wool manufacture, and, although it has taken on a substantial production of fancy worsteds, the concern is still one of the im-

¹ During the war period profits increased, as they did in practically all wool mills. Dividend rates were not increased, but resort was had to the more dubious policy of substantial stock dividends,—25 per cent in 1915, 50 per cent in 1918, and 5 per cent in 1919. As a result, capital per loom was brought up to approximately that of the American Woolen Company.

portant operators in staple goods of wide and relatively steady consumption. Again, it is one of the large producers of worsted yarns for both the knitting and weaving trades, another product of the wool-working industry — a “half-product,” to be sure — which is pretty well standardized. Beginning with the sale of occasional surplus production, the yarn department, it is said, has increased six-fold, until it is now considered “a most important part” of the Company’s business.¹ If to these two chief factors are added the advantages incidental to large operations, better buying power, and the like, there are obviously sufficient bases for success.

More conspicuous and in some respects more noteworthy are the cases of real combination, cases of the union into a single venture, at one time and on essentially uniform terms, of previously independent plants. Only two examples of organizations along this line have existed in American experience, the American Woolen Company and the United States Worsted Company. But with respect to these enterprises the evidence upon the bases of success or failure is more plentiful than with regard to the consolidations above noted. Furthermore, the characteristic features of large-scale management are more evident. And incidentally opportunity may be taken to contrast the developments in the field of wool manufacture with the misfortunes of combinations in the cotton-manufacturing industry.² Therefore, a wide variety of data pertinent to the history of these combinations must be presented here, though the task should take us somewhat afield.

The first and chief combination in the wool-manufacturing industry — the American Woolen Company just mentioned — was, like combinations in many other lines, a by-product of the

¹ A publication of the Company, entitled *The Clothing of the People*, 1922, p. 27.

² It is of interest to summarize the misadventures in the cotton-manufacturing combinations. One “was consistently a failure for upwards of fifteen years;” and “after three successive reorganizations it was divided into two parts” which came under separate managements. Another failed twice, and “ultimately one mill after another was sold to independent textile operators.” The third “proved unsuccessful after two or three years,” and like the first was split into two parts which were operated thereafter by distinct managements (Dewing, *Financial Policy of Corporations*, iv, 28-29).

depression in the middle nineties. The depression was made peculiarly severe in the wool manufacture in consequence of the change in the Wilson tariff, which permitted the importation of wool duty-free for the first time in over thirty years, and took away the "incidental" protection that manufacturers had been receiving from the so-called compensatory duties. Probably of yet greater moment was the situation created by the rise of the worsted manufacture. The market was already well supplied by the products of the preëstablished woolen industry, and readjustment was inevitably difficult. Something of the struggle and its incidental damage is evident in the Census figures showing value of products in the two branches of the industry: between 1879 and 1899 the value of products in the worsted manufacture had increased from 33 to 120 million dollars, but meanwhile that in the woolen manufacture had declined from 160 to 118 millions.¹ Such a shift was impossible without much friction and loss, which undoubtedly went far to intensify the force of the depression in the nineties. Some concerns, such as the Arlington Mills and the Pacific Mills, seem to have borne up satisfactorily under the conditions. At least, they kept up their dividend payments. More typical, I believe, was the experience of such concerns as the Hamilton Woolen and Middlesex Woolen companies. In these cases dividends averaging 6 and 9 per cent, respectively, in the years of 1890-93 fell to $1\frac{1}{4}$ and 4 in the succeeding four-year period. Indeed, these latter years have been characterized as "the period of least growth, relatively, in the history of the American wool manufacture for half a century;" and again, as "without any reservation or qualification whatsoever . . . the most disastrous period in the history of the American wool manufacture."² Such a

¹ As indicated above, the statistics of the 1880 Census do not seem wholly trustworthy with respect to the division between worsted and woolen goods. However, between 1889 and 1899 the value of worsted products had risen from 79 to 120 millions, while that of woolen products fell from 133 to 118 millions. Probably the course was the same in the preceding decade.

² *Bulletin*, 1896, p. 93; Mr. S. N. D. North before Committee on Ways and Means, *Tariff Hearings*, 1896, p. 1636.

Another indication of the hard times is the heavy decline between 1889 and 1899

situation, when the return of prosperity made the financial arrangements less difficult, served to induce an attempt at combination within the industry.¹

In February, 1899, rumors of a possible combination in the wool manufacture began to circulate; and in March of that year it was definitely announced that an organization had been effected. The leading spirit was Mr. William M. Wood, at that time treasurer of the Washington Mills of Lawrence, a concern which was just getting back on its feet after a decade of severe trial. Curiously enough, Mr. Wood had received his earlier experience in the cotton-manufacturing business. Associated with him in the task of floating the new enterprise were Mr. James Phillips, Jr., and Mr. Charles Fletcher, each the owner of a small group of mills. These mills, seven in number, formed the nucleus of the whole combination. Subsequently, nineteen other establishments were acquired and assimilated. Among these twenty-six mills were included some of the important plants of the country: besides the above-mentioned Washington Mills, there were the Fulton and the National and Providence Mills, both known for their serges and men's-wear worsteds, and the Assabet

in the average value per square yard of men's-wear goods produced in the American mills, — whereas during the same period the corresponding value for dress-goods was rising or falling much less considerably. A decline in the average weight per square yard for the former would itself in part account for the decline; but at this time quality of production was, I fancy, rising and this would counterbalance the depressing effect of the decrease in weight. In the case of dress-goods, weight was perhaps increasing slightly and average quality was rising. However, the difference in conditions in the cloth and dress-goods sections do not seem sufficient to account for the variation in trend. Statistics for all-wool goods are sufficiently typical for illustration:

AVERAGE VALUE PER SQUARE YARD

All wool:	1889	1899
Cloths, etc. — woolen	92.6 cents	66.0 cents
Cloths, etc. — worsted	127.2 "	79.6 "
Dress goods — woolen	35.7 "	38.6 "
Dress goods — worsted	34.5 "	28.2 "

¹ In addition, combination in the wool manufacture was no doubt stimulated by the example of similar developments in other fields; and probably not without influence was the personal element of an energetic promoter, Charles R. Flint, in this case appending the American Woolen Company to a line of other exploits.

Mills, located at Maynard, Massachusetts, one of the largest woolen mills of the American industry. Most of the mills were located in the Providence or Lawrence-Lowell areas; but isolated concerns, from Moosup, Connecticut, to Skowhegan, Maine, were taken in.¹

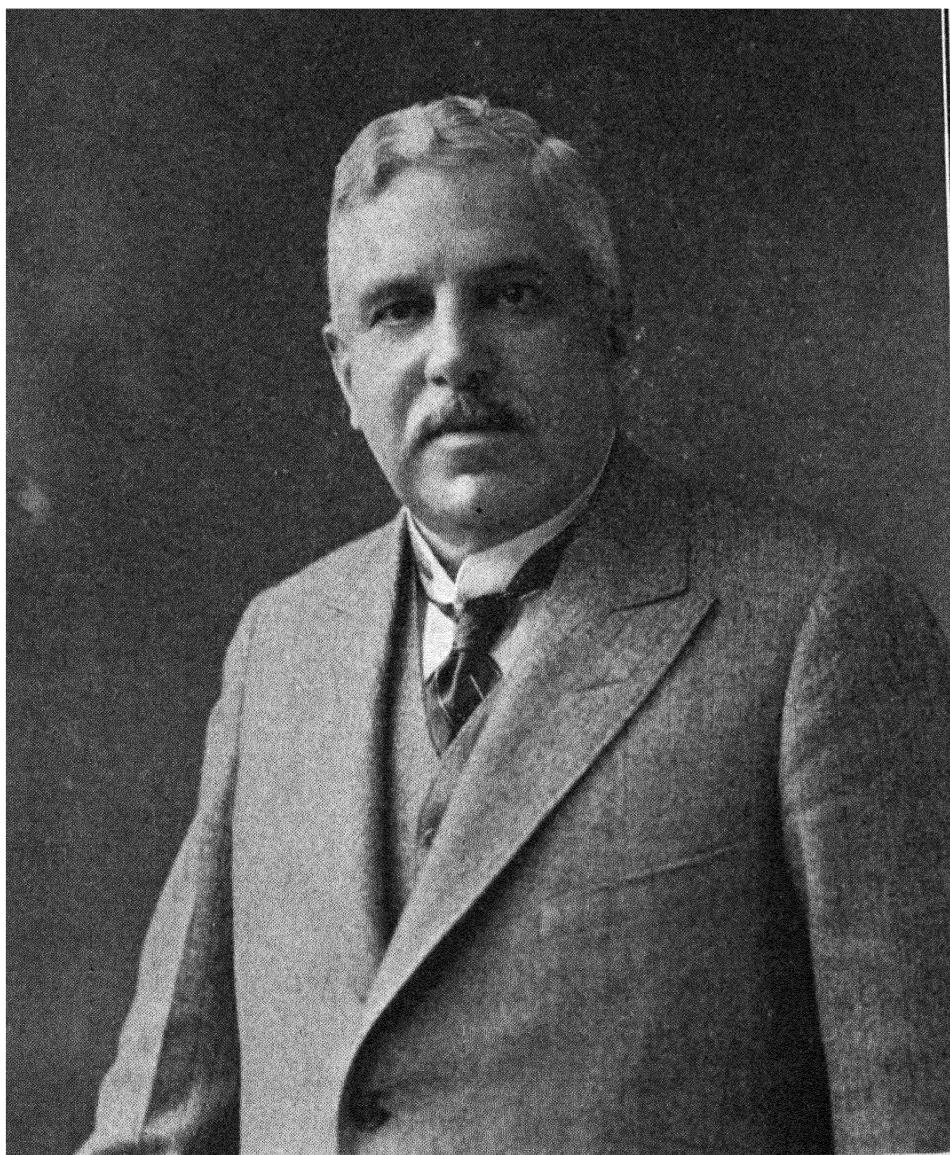
Although of extraordinary magnitude in relation to either American or foreign experience, the manufacturing capacity of the American Woolen Company, as at first organized, did not presage control of the domestic market for wool fabrics. The enterprise was not a monopoly of wool manufacture in any sense of the word. The Company's mills, for example, contained 541 sets of woolen and worsted cards, as compared with 6605 sets reported for the whole country in the *Census of 1900*. In spindles and looms there was about the same relationship: approximately 300,000 spindles of all types in the Company's plants against a total of 3,500,000 for the nation; and 5400 looms against 63,300.² The scope of its mills, however, was not all-pervasive either in the woolen or the worsted branch of the industry, the weakness in women's dress-goods being particularly important.³ The concentration of its activities in fewer fields of course made for greater strength of the Company in those particular lines. Its power was especially great in the field of men's-wear goods. The proportion of its equipment to the total of such machinery in the country was estimated to be "very large," being placed more specifically, though apparently with substantial exaggeration, at "about 70 per cent" for men's-wear worsted goods, and "about 50 per cent" for similar woolens.⁴ With respect to these lines,

¹ At the time that the scheme of the American Woolen Company was being hatched, another similar project is said to have been under consideration by a group of millmen, the most notable of whom was Mr. William Whitman. This latter contemplated the inclusion of some of the plants actually acquired by the William Wood organization, and so after the launching of the American company the other scheme was dropped. Apparently there was felt to be room at that time for only one such combination in the domestic wool manufacture.

² Statistics for the Company's equipment are taken from Mr. Wood's testimony before the Industrial Commission, *Report*, xiv, 513.

³ It was stated as late as 1905 that the American Woolen Company made fabrics "for men's wear exclusively" (*Boston News Bureau*, March 17, 1905).

⁴ *Bulletin*, 1899, p. 208; *Commercial and Financial Chronicle*, lxxi, 1316 (official statement to the New York Stock Exchange).



WILLIAM M. WOOD

The chief projector of the American Woolen Company
and its guiding spirit during the first quarter-century
of operation

the position of the Company must be admitted to have been one bordering on quasi-monopoly, and suggested the possibility of considerable influence by the Company in the control of the market for such fabrics. Again, it is important to note that in this production was a substantial yardage of serges, cassimeres, and the like, as, for example, the Washington and Fulton serges, — in other words, the fabrics spoken of above as susceptible in a greater measure than other wool goods to standardization and large-scale production. This was a good foundation upon which to build.

Since its formation the experience of the American Woolen Company has been noteworthy in various respects; growth in size, improvement in methods of operation, influence on the cloth market, labor policy, and its financial progress. It is proposed to discuss these features *seriatim*, dealing, however, with only the more general elements in each.

Growth in size. From a union of twenty-six mills the Company has expanded to number fifty-nine establishments, and there has been a corresponding increase in manufacturing capacity. The number of worsted combs has increased approximately 150 per cent, cards 100 per cent, spindles of all types 150 per cent (the advance probably being greatest in worsted spindles), and looms about 85 per cent.¹ This enlargement has in large measure been due to the absorption of concerns previously independent, some twenty-five having been purchased since 1899. All but three of these mills are located in New England, with especially large representation in Maine.² Again, machinery has been added and extensions have been made to existing plants. One of the outstanding developments of the Company, however, has

¹ Statistics as to the present equipment of the Company's establishments have been taken from its pamphlet entitled *American Woolen Company's Mills*, published in 1921.

² The acquisitions have not been confined to any particular period of the Company's history. As early as 1901, two mills in Lawrence were bought at an auction sale; and as late as 1923 the largest single purchase was consummated, that of the Slater mills at Webster with their thirty-eight sets and 400 looms. Among the sixteen woolen mills which the Company now owns in Maine are included many of the most important establishments located in that state.

been the construction of new plants, especially the Wood and Ayer mills of Lawrence, and the new mill at Shawsheen Village, Massachusetts. As a result of all these measures, the increase in capacity of the Company has been substantially more rapid than that of the whole American industry. Thus, as against the 150 per cent increase in worsted combing machines above mentioned, the growth for the whole country since 1899 has been only about 60 per cent. In spindles, the respective increases have been: for the Company, 150 per cent, and for the country, 85 per cent; in looms, 85 and 25 per cent, respectively. Obviously, then, the position of the Company is one of even greater moment to the public interest than at the inception of the concern. However, as far as one can ascertain, there has been no significant change with respect to those lines of production, especially men's-wear worsteds, in which it held a predominance already in 1899. Rather, the increase in capacity has gone to build up the Company's production in fields previously neglected, — women's dress-goods, blankets, and the like, — though with some addition also to its interest in men's-wear woolens. The extremely rapid growth of the Company, then, has not meant any large increase in menace to the competitive producer or to the consumer.

The progress of the Company, it may be noted further, has not been merely in quantity of machinery. One of the first steps taken by the management after the launching of the combination was to transfer machinery from certain mills to others. One mill was closed entirely, as "it was antiquated and located in an undesirable place for woolen manufacturing;" and the production of some of the mills was changed.¹ Such rearrangements flowed in part from a desire for greater efficiency and in part from the policy of specialization among the several plants. In pursuance of the latter policy, the Baltic Mill at Enfield, New Hampshire, had by 1904 been devoted to the production of thirty-two ounce all-wool friezes, and the Brown Mill at Dover, Maine, to the manufacture of light tan kersey, — both of these goods

¹ Mr. Wood, before the Industrial Commission; *Report*, xiv, 514, 518; and *Bulletin*, 1899, p. 272.

being overcoating material.¹ Again, the Beaver Brook Mills at Dracut, Massachusetts, turn out nothing but bed blankets, and the Riverina Mills at Medford, Massachusetts, are employed solely on the recovery of wool fiber from wool wastes and wool rags. How much further this policy is carried, unfortunately does not appear; nor, of course, have we any good notion of the gains thereby derived.

As a result of these various extensions and improvements, together with other factors such as the introduction of improved machinery, the volume of production by the Company was stated to have doubled as early as 1903.² Data as to the Company's sales do not indicate quite so rapid a rise, but do suggest such a situation, as far as value of output is concerned, by 1906 or 1907. Meanwhile, the production of woolen and worsted fabrics by the whole American industry had in value increased only by about 75 per cent.³ Again, it was "calculated" in 1899 that the original equipment of the Company's plants was "capable of producing some 30 million yards of cloth annually,"⁴ whereas, according to a pamphlet of the concern published in 1919, its total capacity of all classes of fabrics was then 70 million yards per annum.⁵ It is somewhat uncertain how accurate

¹ *Boston News Bureau*, September 7, 1904.

² *Annual Report of the Company for 1902*, p. 2 (January 3, 1903).

³ The statistics of sales, in so far as available — their announcement was discontinued after 1908 — are as follows:

1899	\$20,598,049 (March to December)	1905	\$48,660,449
1900	29,673,207	1906	51,420,696
1901	34,839,690	1907	47,377,846
1902	35,522,977	1908	29,986,978
1903	38,097,558	1909	48,700,000 (approx.)
1904	39,446,832		

Of course, there was an enhancement of prices during this period, but a lowering of average quality would counterbalance in whole or in part this change. With such a heterogeneous production as that of the American Woolen Company, it is a difficult matter to estimate quantity from the basis of value. The *Census of 1910* gave a value to the products of the woolen-goods and worsted-goods industries of 423 million dollars as compared with 238 millions in 1899.

⁴ *Bulletin*, 1899, p. 272.

⁵ However, in 1919 the actual output was only 49 million yards (*Wall Street Journal*, p. 102, May 27, 1920). Seventy million yards is here stated as the Company's "normal output."

A recent popular statement of the Company's huge production asserts that

these figures are; but at least the increase on the basis of quantity has been substantially less than on the basis of value. With these data, however, should be compared the enhancement in quantity of all American mills, — only 25 per cent between 1899 and 1919.¹ Obviously, the growth of the Company's capacity, significant on an absolute basis, is even more suggestive when the conditions in the whole industry are considered.

Selling Methods and Policies. In the distribution of its products the Company has displayed ingenuity and good judgment mixed with courage, while its influence upon the whole has been for the improvement of the trade. Its most notable contribution perhaps has been to endow with greater significance than ever before the "openings" which form so important a part of the present cloth-selling mechanism. Semiannually, usually in February and August, the Company definitely "opens" its lines for the succeeding season, sometimes for all its departments at once and sometimes one or two departments at a time,² displaying its designs for the coming winter or summer period, and stating its prices for the numerous fabrics. These openings attract interest throughout the trade, and, if a good selling season is anticipated, the Company's showrooms will be crowded from morning till night. Upon the basis of orders then placed the manufacturing end immediately commences operations.³

"enough woolens and worsteds are woven per year by the American Woolen Company to provide suits of clothes for more than 20 million people" (*Outlook*, January 10, 1923, advertisement of the Company).

¹ The *Census of 1900* gives a total production of 427 million square yards for the woolen and worsted-goods industries; and that of 1920, one of 535.9 million square yards.

² To handle efficiently the large and diversified production of its mills, the American Woolen Company at the beginning of its career organized its New York direct-selling house into a number of semi-independent departments, each with its own selling staff. The original alignment provided for four such divisions: worsted and woolen staples, fancy worsteds, fancy woolens, and cloakings and suitings. Subsequently, there has been a minor rearrangement of these classes, putting all the woolens together, and, with the expansion in scope of the Company's operations, there has come the addition of three more departments: women's-wear, blankets, and specialties such as uniform cloth, shoe cloth, etc.

³ In reality some of the preparatory sections of the mills often commence operations somewhat before the openings terminate, — sections on worsted spinning and the like.

Not only in the improvement of selling methods but also in bettering the moral tone of the trade, the Company has been influential. For many years the business of cloth distribution has suffered from the evil of cancellations. Buyers have too often considered themselves free to refuse acceptance of goods ordered, when it suited their interests to do so. Against this usage the better elements in the trade have struggled continually, and to this policy the Company gave its cordial support. Moreover, by reason of the Company's size and of the desire of clothiers and other buyers to "stand well" with it, the Company has been able to exercise a considerable direct pressure toward the eradication of this particular evil. Again, the Company co-operated rather recently in the establishment and maintenance of an "open-price association," by means of which it was hoped to secure greater stability in the prices of wool goods.¹ Such policies, together with the support of the Company to the guarantee of prices over individual seasons, are in a way the fulfillment of a prophecy made at the time the Company was organized, that it would have "a larger interest than any other corporation in the restoration of legitimate methods in the woolen trade, and a larger power to effect it."²

Even beyond these features of trade practice, however, the influence of the Company upon the tone and price level of the market for wool fabrics has unquestionably been great. Apparently, more and more the trade has come to depend upon the "big company" for the direction of the industry in the following season, for setting the pace. Typical expressions of the part played by this concern are: "Business in new heavy-weight woolen and worsted suitings has been slow and buyers are apparently waiting for the opening of the American Woolen Com-

¹ In point of fact, either from fear of governmental interference or from lack of real practicality for the wool-goods trade, the association never was of much value in stabilizing price conditions. More recently it has been dissolved.

² Mr. S. N. D. North, Secretary of the National Association of Wool Manufacturers, in its *Bulletin*, 1899, p. 210. The Company, by reason of its importance as a seller of cloth, is able to take sterner measures with men or firms in the clothing trade that seek to free themselves from unfavorable contracts. It can refuse them goods in the succeeding season. In this way it can weed out undesirables among its clientele. Thus, mere size gives special gains.

pany's lines;"¹ or "selling agents are generally reserving their showings (in men's-wear) until the American Woolen Company makes prices."² More particularly, among the quotations on the Company's fabrics the prices of certain standardized fabrics are watched at the openings, and above others the so-called Fulton serge 3192. It is a cloth of well-known and fixed construction, which has been manufactured for years, and for which there is always a considerable sale. Consequently, as Professor Cherington has said, "it has come to be regarded as a standard of reference in the trade. Its price, as announced by the American Woolen Company when it opens its season's lines, is widely accepted as virtually this Company's estimate of what the sum of the cost of wool, manufacturing cost, and a minimum mill profit is to be for the season."³ And "this Company's estimate carries great weight with the trade."³

But the opening prices of the Company's sales are not always a mere statistical analysis of existing industrial conditions. The Company has used its influence, though perhaps unintentionally, to give the right cue to the trade when the future seemed uncertain to many dealers. For example, after the crisis of 1907, the "big fellow" determined upon a new start, writing off the loss in values. At that time, "considerable satisfaction was expressed in dry-goods circles at the action of the American Woolen Company in squarely meeting the changed conditions and opening their new light-weight men's-wear woolen and worsted lines at more severe reductions compared with last year than many had in any way looked for."⁴ Again, when the trade was in the doldrums after the armistice in 1918, wondering what was coming next and afraid to go much beyond hand-to-mouth business, the American Woolen Company opened up with sharp reductions in its prices.⁵ This event had an electrifying influence at once,

¹ *Commercial and Financial Chronicle*, lxxii, 200 (January 26, 1901).

² *Textile World Journal*, lvii, 405 (January, 1920).

³ Cherington, *The Wool Industry*, p. 101.

⁴ *Commercial and Financial Chronicle*, lxxxvii, 177 (July 18, 1908).

⁵ Cf. statement of *Textile World Journal*, March 1, 1919: "The influence on the market so far of the American Woolen Company's aggressive policy is unmistakable" (lv, 1475).

starting the renewal of activity in the industry, which lasted until the crisis of 1920. In 1921, too, the Company again swallowed its losses, as the phrase goes, and by directing prices to a lower level, was instrumental in a considerable measure in breaking the "consumers' strike."¹

In the way of direct influence upon the general course of prices for wool fabrics, the American Woolen Company seems ineffective. Despite its extensive production of certain lines of fabrics, suggestive of a quasi-monopoly in these portions of the industry, the movement of its prices for such goods is not indicative of any monopoly gains when compared with the movement of prices for other wool products. The reason for this situation seems to me to lie in the fear of actual and potential competition, combined with the play of the style element. In the standardized and semi-standardized men's-wear fabrics, there is competition from the small differentiated mill, which is often able to pick up lots of yarn advantageously in the market, and from the other large-scale producers of such goods in the American industry, as, for example, the Cleveland Worsted Company. Then, too, if a price materially out of line is insisted upon by the

¹ An interpretation of the Company's policy in situations such as those above mentioned, which is less favorable to the big concern, has considerable currency in the trade. Declines in price at these times are held to have frequently been more severe than underlying economic conditions really warranted at the various periods, — the Company has in a sense broken down the market temporarily. These decreases, it is said, have brought prices so low on occasion that they barely covered costs of production for the Company, if indeed they did not fall below such costs. And the reason for this apparently unwise policy is found in the pressure upon the concern to keep its machinery running in order to cover its large overhead; while the wide fluctuations in the Company's earnings and the failure of the Company over some years to pay dividends upon its common stock are regarded as circumstantial evidence of the correctness of this viewpoint.

Discussion of this contention must in part await consideration of the concern's financial experience, but at this place it is possible to suggest that the allegations appear to the impartial observer as interesting, surely not without an appreciable element of truth, but on the whole not proved. To be sure, the enterprise is not to be viewed as a striking financial success, and, of course, it is entirely possible that it has grown too large and unwieldy. But it seems a bit previous as yet to lay great stress upon the less hopeful features of the Company's situation while it is still vigorously active, efficiently managed, expanding, and apparently still able to weather many storms.

American Woolen Company for these fabrics, many producers of specialty or stylish goods will be induced to divert their attention to this field. On the other hand, for goods other than the standardized types, the element of style is particularly important, and no concern has a monopoly of fabric design. For the finer woolen fabrics, where generally speaking this element is dominant, a mill of a hundred looms is perhaps the maximum size for effective designing, as has been suggested. Moreover, the small mill is able to shift its production quickly in consequence of a style change, when, as at present, the efforts of the wide-awake individual manufacturers are rendered more effective by the aid of well-organized means of disseminating trade information. Again, competition in this portion of the field is active or potential from abroad as well as from the other domestic mills, being more important here than in relation to the standardized fabrics. Such competition is the more threatening because in the conversion of cloth into wearing apparel considerable difference in the price of the fabric causes a relatively small variation in the price of the garment. From the side of the cloth buyers, too, there are forces which would militate against the success of any general attempt by the Company to extort monopoly prices. Not only are there an appreciable number of large operators in this field who could readily resist such action, but, as one of my correspondents has stated with only moderate exaggeration, "the entire personnel of the garment manufacturing industry is drawn from the descendants of the shrewdest and smartest nation of traders that has ever existed." In the face of such possible opposition, the Company might do well to go slowly.

In fact, the Company has, I believe, fixed upon the wiser policy of quoting good, average, though competitive prices, relying upon the assured quality of its products, upon its capacity for the largest order, upon the maintenance of a large stock of its staple goods, and upon efficiency of operation, to secure a maximum of turnover with a sufficient spread between its costs and the going market price to afford a substantial profit.¹ It appears

¹ The ability to quote "good" average prices is of course dependent upon the economic situation. If, as not infrequently is held, the Company is forced

probable, as regards the last factor, that few if any mills in the United States can turn out goods as efficiently as those of the American Woolen Company, both by reason of the considerable specialization of product among the various establishments and of the economies of large-scale operation. In addition, the Company is said to maintain a research department on technical matters, almost unique among American mills, — I know of but one other. Although it is uncertain how much emphasis is placed upon this phase of the business, — and of course the results are not broadcasted, — the fact is significant both of the Company's effort for differential advantage and of its progressiveness. Finally, the attainment of the largest possible turnover is, one should note, a point of extreme importance with the American Woolen Company. It may perhaps be considered a guiding maxim of the organization. Repeated expression has come from the Company that "every loom and every spindle shall be fully employed;" that "there is no money in idle machinery;" and that "Mr. Wood insists on running his mills full."¹ The natural resultant of this policy is that the Company for the most part must make its prices "right," so as to get the business, even though the margin of profit on each transaction may perhaps be narrow at times. In following such a scheme, the American Woolen Company points a moral not only to many other concerns in the wool manufacture, but to a multitude in other fields.

It must not be inferred from the above description of the concern's selling policies that it is either a public benefactor or an infallible judge of conditions in the goods markets. It is pro-

at times to cut its prices drastically (see p. 239, note 1, above), obviously the profit is all or nearly all eliminated.

An incident illustrating the advantages of the maintenance of stocks of goods is said to have occurred in 1917, at the outbreak of the War. The Quartermaster General of the Massachusetts militia was feverishly trying to find blankets for the newly mobilized men. He inquired of several smaller mills and could secure only promises of supplies in a month, three weeks, etc. Then he called the American Woolen Company, stating the number he wanted. The reply came back: "They'll be in Boston tomorrow."

¹ For example, see *Boston News Bureau*, July 25, 1901; August 24, 1901; July 30, 1903; December 16, 1903; May 2, 1911.

ducing fabrics for a profit, and naturally attempts to secure the maximum possible prices for its goods. The government was unsuccessful in proving any real "profiteering" when that campaign of inquiry was on in 1920; but the configuration of the price curves for various Company fabrics over the period since its organization, suggests that at times it has tried to "crowd" the market. Aiming at the fullest possible market price, the Company has seemingly overstepped the boundary of discretion, as when after a sharp increase in prices in 1910 there followed a somewhat similarly sharp drop the succeeding year. Indeed, these price curves are rather remarkable for the number of changes in direction.

A more outstanding case of misjudgment is concerned with the efforts of the Company to establish a foreign trade in its products. Apparently it was carried away, with many other companies, by the export furore of the war and early post-war periods. In the saner days of 1914, the President reported that "after a determined effort to sell our fabrics in the open markets of the world, we have been forced to the conclusion that as a general proposition we are unable to compete with the low-wage labor of Europe."¹ Yet the next year his opinion was veering around. Now this export trade was to be "sedulously followed."² By 1917 a subsidiary concern, the American Woolen Products Company, had been incorporated to take care of this new business, and connections had been established for selling purposes in various foreign countries. In 1919 such branch offices and representatives existed in fourteen foreign countries besides "Central and South America," including such important wool-manufacturing nations as England, France, and Belgium.³ Here was an "American invasion" with a vengeance! In another

¹ *Annual Report for 1914*, p. 2.

² *Annual Report for 1915*, p. 3.

³ *Annual Report for 1919*, p. 3. The Products Company had meanwhile undertaken a somewhat diversified trading business. Cotton textiles, knit-goods, silk goods, hosiery, leather, and leather findings were exported; wool, and wool and cotton yarns were purchased and resold abroad; while manufactured goods and raw materials were imported. This last measure was undertaken because of the difficulty which foreigners had now encountered in financing purchases in American markets.

year, however, the business was "very quiet;" and at the end of 1921 the Products Company was liquidated. The Emergency tariff was in part blamed for this sudden demise, but again, as in 1914, the President was impressed with the "low cost of production" in European countries.¹ It is conceivable that the profits on this foreign business during the brief period of its heyday more than compensated for the effort involved,² but it should be observed that, in so far as plant facilities were extended in the prospect of such business, the ultimate cost may go far to wiping out the immediate profits. But immediate gain seems to have been at least not the major feature in the program. The establishment of a separate corporation and of a series of foreign "branches" for the handling of this export trade points to an anticipation on the part of the Company's directors that such a trade would thereafter be a normal portion of its operations, though the idea of a permanent outward trade in American woolen fabrics is to most conservative observers distinctly chimerical within the visible future.

Labor Policy. In its treatment of labor, as in its selling methods, the American Woolen Company may fairly be said to be a leader in the industry. It is in large measure responsible for whatever unfortunate policies the wool manufacture has adopted and for whatever disagreeable situations that manufacture has found itself in, as well as for the beneficial attitudes that the industry has assumed; and in many ways it has been far-sighted as compared with most of its competitors. Early in its career, seemingly, it adopted the policy of paying the highest wages obtaining in the trade. Sometimes, as in its bonus or premium system prior to 1912, it rendered itself unpopular among the workers by insisting on a *quid pro quo* for such higher wages. But all along it has probably been true that a worker could earn in the Company's mills as much as in the outside establishments, or more. The aim obviously was to combat one of the great evils on the

¹ *Annual Report for 1921*, p. 3.

² Shipments of \$1,300,000 in goods were reported for 1917 (*Annual Report* for that year, p. 3), while by 1919 the delivery of \$4,500,000 worth of goods apparently of all sorts, and unfilled orders of \$4,800,000 are mentioned (*Annual Report for 1919*, p. 3).

labor side of the wool manufacture, — high labor turnover. This line of policy, it should further be emphasized, has been pursued in a considerable degree independently of the rest of the industry. This was evident in the period of rising wages prior to 1920, when the "big fellow" frequently led the advance within the wool manufacture; and again in 1922, when at a time of agitation for lower wage rates it was stated by "him" that wages for the current season would under no circumstances be reduced.¹

The Company, too, has been as forward as most other concerns in the industry, and indeed ahead of the great majority, in adopting a welfare program. In its mills cleanly conditions are maintained, sanitary arrangements are good, and frequently special facilities, such as low-cost restaurants, are provided. In connection with some of the larger plants, workers' houses, model tenements, and recreation houses have been erected. The construction of a model village about the Shawsheen Mills is but a continuation of this development.

At the height of the wave of prosperity which culminated in 1920, the Company embarked upon a whole series of noteworthy, if somewhat belated, schemes for benefiting its employees, — or perhaps allaying the labor unrest.² Not only was the home-building project largely expanded and the forty-eight-hour week adopted, but, under the direction of a new Department of Labor in the organization, its employees were insured without cost to themselves, under a group life-insurance plan. They were presented with an elaborate system of sickness, accident, and maternity benefits, and were assured substantial pensions in their old age. Likewise, they were enabled to secure a stake in the concern by a liberal system of stock sale, with of course the usual requirement of "continuous service" in the Company's mills.

¹ A story is told about one of the later increases of wages in the period before 1920, that Mr. Wood called various leading wool manufacturers together and told them he was going to do thus and so, — it was a 20 per cent increase, I believe, — and intimated that his competitors could do what they liked about it; for his part, he was going through with the advance.

² The Company had had a bad experience in the Lawrence strike of 1912. Perhaps its more recent attitude toward labor matters is not unconnected with that episode.

Such schemes, especially that of gratuitous sickness, accident, and maternity benefits, were distinctly in advance of the industry as a whole.¹

The result of such policies, as indeed of the whole attitude of the Company, may well have been to secure and hold a somewhat better group of operatives than the competing mills could command; and probably the additional efficiency of these workers more than made up for the higher earnings paid or higher expenses incurred. The pace set, moreover, was unquestionably disquieting to the independent manufacturers, and incidentally may contribute to the willingness of some concerns to sell out to the growing "combination." Perhaps, however, the Company advanced too rapidly for its own good, at least, in the early post-war years. The coming of less satisfactory business conditions has led recently to a curtailment of various welfare schemes, — the health insurance, for example, being discontinued. Accordingly, while the Company's general policy indicates what seems to be an energetic and farsighted grasp of the situation, there is at present some doubt as to just how far it can be carried out in practice.

Financial Experience. No detailed study of the financial policies and record of the American Woolen Company can be attempted here, but at least two features on the financial side should be noted: the general quality of its financial operations, and some estimate of its earnings.

The character of its financial policy is in part revealed by a study of the Company's annual balance-sheets. For example, the item of plant was originally placed at approximately \$40,000,000. This figure was probably a seriously inflated one in 1899; but at least it is significant that in 1920, despite the addition of a score of mills, including the mammoth Wood Mill,

¹ *Annual Report of the Company for 1919*, p. 2; *Commercial and Financial Chronicle*, cxii, 2308. Not without effect, also, was the Company's well-advertised contest with the "profiteers" of Lawrence in 1919-20, when the Company set up retail stores of its own in certain lines. One might mention in addition the distribution of milk through the mills in time for lunch, a two-weeks' vacation for the children of mill operatives free of charge at a Company camp in Boxford, and educational facilities organized for the workers by the Company.

this item has been increased by only \$10,000,000. It is notable also that the increase in capitalization has not kept pace with that of manufacturing capacity, at least as measured by the quantity of machinery. Whereas in 1900 capitalization per loom had amounted to over \$9000, the latest figures available, even after the recent doubling of its common stock, show that the Company has a capitalization per loom of but \$8059. Meanwhile, the mills generally through the country have shown a marked enhancement of capital. The Census statistics, which had indicated an average capitalization per loom for the whole wool-cloth industry of only \$4200 in 1899, give the corresponding figure as to 1919 of nearly \$11,000. There may still be found mills with a much lower capitalization per loom than the American Woolen Company, e. g., the Standish Mills with only \$6250, or the Talbot Mills with but \$2500. Yet unquestionably the "big company" now stands much more closely in line with representative concerns of the wool-working industry than it did in 1900. Indeed, it seemingly enjoys a somewhat lower capitalization in relation to manufacturing capacity. Again, although the mills of the Company, or at any rate the mills originally acquired, were purchased with equal portions of common stock in the new company and of cash, dividends upon such stock had not been paid prior to the war, even though the books of the Company showed a considerable and relatively steady increase of surplus, amounting to 50 per cent on the outstanding junior stock by 1911. Instead, the Company devoted its funds to the reduction of this capitalization, writing off \$9,500,000 in this same year, 1911.

But perhaps most significant of all has been the Company's policy with regard to financing the erection of new mills. The acquisition after 1899 of already existing plants was carried through largely by the increase of its preferred stock, which grew from the original \$20,000,000 to twice that amount in 1909; but not the construction of such mills as the Wood and the Ayer. For this purpose a new corporation was, in each case, created, having the same officers as the American Woolen Company; and funds for the actual building were secured by the sale of its notes

or bonds. These securities were, to be sure, guaranteed by the Company, but the accounts of the new mill and its profits were kept separate until these obligations were paid off. Thus, not merely were the plants of the Company kept free from any direct mortgage, but the extension was made to pay for itself and was not admitted into full partnership with the rest of the establishments until it too was free from debt. Confidence in the ability of such an offspring to take care of itself may well have added to the marketableness of the \$5,500,000 worth of bonds — really but the mortgage on a small tract of land — floated in 1921, when the project of the Shawsheen Mills was matured, although of course the guarantee of the parent company was the more important factor.

Full consideration of our second point, that of earnings, would lead us far into the realm of corporation accounting, and, more important still, into dark places of doubt and conjecture: the data published by the Company are not adequate to give basis for very definite conclusions. The chief point of uncertainty is the treatment of depreciation, replacements, and betterments in the financial returns of the concern.¹ It will suffice for our purpose to record some of the more obvious and better documented facts. First, the 7 per cent dividend upon the Company's preferred stock has been paid regularly since 1899, and this despite a doubling in its amount.² Again, a substantial surplus was

¹ Some discussion of this last matter is given in my article in the *Quarterly Journal of Economics*, xxxvii, 436-475 (May, 1923). To the data there presented, I would add a note from the *Boston News Bureau* of March 20, 1911, from which it appears that the amount charged off to depreciation in the early years was considered inadequate by the Company itself. When in 1911 the common stock was reduced by nearly \$10,000,000, it was explained that the amount charged off to depreciation by the Company had varied widely from year to year, but that this reduction in the common stock "would be equivalent to depreciation for eight to ten years." This particular method of making up deferred depreciation charges is well described as "something new" in the handling of industrial financing. However, for our purpose it is sufficient to note that the doubt advanced in the article just mentioned as to the adequacy of the Company's depreciation charges was apparently well justified.

² In 1923 the volume of preferred stock was increased by another \$10,000,000, — to provide funds for the acquisition of the Slater mills and for working capital, — thereby bringing the amount of this stock to 250 per cent of its original figure.

built up, even in the pre-war period; and probably this was in addition to sufficient allowances for wear and tear, obsolescence, and the like. This surplus was derived from the large profits of the earlier years. Let us look at the figures. By half-decades the net earnings on the preferred stock minus the depreciation charges set up by the Company, and on the junior stock minus depreciation and preferred dividend charges, averaged as follows:

	On Preferred Stock	On Common Stock
1900-1904	14.03	4.74
1905-1909	8.19	1.57
1910-1914	5.76	0.00

Earnings held up well through the crisis of 1907. Thereafter, in the troubled years till the World War, profits were meager, — not enough to cover payments on the preferred stock, — but the Company fared better than many textile concerns, and the receiver was never at the door. Its history, too, compares favorably with that of various combinations in other fields, and with the other combination in the wool manufacture (to be discussed below), which in that period was passing through reorganizations and severe financial stringencies.

Finally, we may chronicle the Company's conspicuous prosperity of the war and early post-war periods. As with most concerns in the wool manufacture, the war came as a distinct boon, — in this particular case, after years when payment of preferred dividends had eaten into surplus to the tune of \$4,000,000. The Company's net earnings on the common stock, i. e., after caring for depreciation, reserves, and preferred stock charges, mounted from 6.40 per cent in 1915 to a maximum of 86.36 per cent in 1918.¹ Now substantial disbursements could

¹ The earnings year by year on the basis indicated above were as follows: 1915, 6.40 per cent; 1916, 15.32 per cent; 1917, 65.61 per cent; 1918, 86.36 per cent; 1919, 39.89 per cent; and 1920, nothing. (In arriving at these ratios, reserves set aside in one year and later restored to surplus are themselves restored to the earnings of the year when first set aside.)

It will be appreciated that these profits were in considerable measure "paper" profits, due to the general upswing of prices, and that by reason of increased Federal and State taxation the Company was by no means as fortunate as the bald percentages suggest.

be made to holders of the junior stock, hitherto sadly neglected; undoubtedly sufficient sums could be charged to depreciation, making up, if necessary, delinquencies of the past; reserves for the insurance and pension schemes above mentioned could be set aside; and the surplus account could be swelled from \$8,000,000 to \$31,000,000. Then, by writing off in 1919 over \$7,000,000 for "possible decline in inventories," and by the sale of \$20,000,000 additional common stock just as the 1920 crisis broke, the Company entered the subsequent depression in an unusually advantageous condition.¹

Now let us pause to discover, if we may, the prime sources of this extraordinary development with its substantial financial success. By what forces has the growth of the Company been advanced, and by what charms does the concern withstand the assaults of keen competition? We may well fix upon three elements which go far to explain the whole problem. First must be instanced the rôle played by Mr. William M. Wood, the true guiding spirit of the whole enterprise. To this self-educated, shrewd, resourceful, domineering son of an immigrant, the American Woolen Company is a living monument. One cannot guess where the Company would be now — indeed, if there ever would have been such a company — had it not been for Mr. Wood's genius. Yet, whether by force of wisdom or chance, he has made much use of a second important factor in the concern's good fortunes, production of standardized or quasi-standardized goods. The staple fabrics of the Fulton Mills, the serges, the plain cassimeres and kerseys, the bed blankets and the simpler worsted dress-goods, — these standardized products have formed

¹ Subsequent years, however, have been trying ones in the American wool manufacture, and the "big fellow" has not escaped difficulties. Dividend payment on the Company's common stock was suspended in 1924. Whether this action signifies much or little is problematical. The situation may speedily improve, or possibly the Company is back to the position which it endured in the period before the war when no distribution was made on the common stock in a fifteen-year interval. The large outstanding body of preferred stock, not only two and a half times the original issue but twenty-five per cent greater than the volume of common stock in the hands of the public, seems to me a particularly great obstacle in the way of the resumption of dividends on the common stock.

a large proportion of the Company's output. For example, it was recently stated that "fully 70 per cent of American Woolen fabrics are dyed blue;"¹ and, while there are all sorts of qualities in blue-dyed fabrics, they are obviously a pretty plain and prosaic sort of manufacture. This is the type of production which is specially advantageous under American economic conditions. Thirdly, there are advantages arising from mere bigness of operation, once the large dimensions have been attained. Direct purchases of wool, because the Company consumes an extraordinary weight and because it can somewhere use up almost all grades; a technical research department; economies in direct selling and in being able in some degree to pick the more reliable purchasers, — these are a few of the more significant benefits. How valuable these three chief bases are may be best observed perhaps in tracing the misfortunes of a less successful competitor.²

This other combination in the wool manufacture, the United States Worsted Company, lacks the commanding interest of the "big fellow" just discussed, although its checkered career lends spice to its humbler story. To be sure, at one time this younger and less influential concern seems to have had hopes of rivaling the American Woolen Company. Not only is the name suggestive of the promoters' dreams, but in the early plans of the smaller Company a half-dozen establishments are mentioned as probable future adherents to the organizing enterprise, together with "three or four other mills" not designated.³ If these plants had been added to those already implicated in the scheme, the combination would have had a considerable nucleus. But this was not to be. Again, there are similarities between the two combinations. The United States Worsted Company, like the

¹ *The Outlook*, January 10, 1923, an advertisement of the Company.

² The contention already mentioned (see p. 239, note 1) may again be recalled: that the large capacity of the Company has frequently forced it to cut prices so radically that its earning power has been seriously curtailed. This feature should perhaps be balanced against the favorable factors spoken of in the text.

³ *American Wool and Cotton Reporter*, xxiii, 145.

American Woolen Company, was a by-product of depression, being devised shortly after the crisis of 1907; both are primarily New England affairs; and both comprise in some proportion the two chief branches of the wool manufacture, woolen and worsted. But beyond these points likeness for the most part ceases.

The United States Worsted Company is really a small organization. It embraces six establishments, but the total machinery equipment is less than that in the single plant of the Atlantic Mills, at Providence, Rhode Island.¹ The Company at first included only three mills, none of them large; to which have been added a worsted spinning plant, a dyeing and finishing establishment, and a relatively extensive weaving mill, the last being built by the Company. But its career has not been a happy one.

Apparently the first few years were not without some success, although data concerning this period of the Company's existence are insufficient to judge closely. The balance sheet of the concern for 1911 shows a surplus of \$750,000. Moreover, it was stated in 1912 that an audit by Price, Waterhouse & Company had shown the \$210,000 of dividends (7 per cent) on the (\$3,000,000) preferred stock to have been "earned and paid."² But this seems to have been the height of the Company's prosperity. In the same year the concern went through reorganization, the reason for which was alleged to be merely that it had "outgrown its financial resources."³ The Lawrence Dye Works, previously leased, was incorporated into the Company, and a worsted spinning plant was purchased. In the process, the capital stock of the enterprise was increased from \$6,000,000 to \$17,000,000. But this was only the flurry which precedes the storm. Within

¹ From the best available information, it appears that the United States Worsted Company operates less than 50,000 worsted spindles, some 5000 woolen spindles, and 850 to 1000 looms.

² *American Wool and Cotton Reporter*, xxvi, 1429. However, subsequent investigation showed that assets had been overestimated by some \$1,000,000! The inventory alone had been "padded" by about \$700,000; and \$135,000 of bills payable had been withheld,— both acts being attributed to "persons still unknown" (*Boston News Bureau*, April 23, 1913 and July 12, 1913).

³ *American Wool and Cotton Reporter*, xxvi, 1429.

a few months the folly of this new arrangement became apparent. The concern could not sustain the burden of such heavy capitalization. As late as August, 1913, it was reported that \$3,500,000 of the outstanding \$5,000,000 first preferred stock was still in the hands of the bankers, and that the latter had made an advance of \$1,000,000.¹ Then another financial scheme was drawn up, involving a virtual elimination of the common stock, and this was approved by the stockholders after a somewhat tempestuous meeting in March, 1914.² Meanwhile, in these troubled pre-war years, earnings failed to improve, falling far short of the anticipated figures; and even up to 1918 no dividends were paid upon any of the stock.³

During the war and post-war periods progress was made toward a sounder basis. The sinking-fund certificates were reduced to \$300,000, a surplus of \$3,900,000 was built up, and the second preferred stock was redeemed until only \$350,000 was outstanding.⁴ But the crisis of 1920 caught the Company unprepared, as it caught so many other concerns, — not like the American Woolen Company with its reserve set up against "possible depreciation of inventory." Notes payable had increased in the statement for December 31, 1921, to \$9,800,000;

¹ *Boston News Bureau*, August 13, 1913. The \$1,000,000 advance may have been made merely to cover the "deficit in the assets" just mentioned.

² *Ibid.*, March 9, 1914. The \$7,000,000 of common stock was reduced to \$700,000; but to cover the \$1,000,000 loaned by the banks, bonds were issued amounting to \$1,300,000.

³ Profits of \$665,000 as "conservatively estimated" (*American Wool and Cotton Reporter*, xxvi, 1429), and even of \$800,000 (*Boston News Bureau*, October 4, 1912), were said to be anticipated at the time of the 1912 shake-up. However, net profits for 1914 were reported as \$241,000, and only \$447,000 in the succeeding year, in both cases without any apparent allowance for depreciation. Against such earnings, charges on the bonds outstanding amounted to \$78,000; and cumulative dividends upon the outstanding first preferred stock reached \$350,000.

⁴ A stock dividend was made in 1918 to holders of the first preferred stock in payment of all accumulated dividends; and subsequently until 1921 dividends on this stock were continued. One dividend of $1\frac{3}{4}$ per cent was paid (1920) on the second preferred stock; and one cash dividend ($1\frac{1}{2}$ per cent) and a 50 per cent stock dividend were made on the common stock. The cash that was thus distributed was soon most urgently needed to support the Company in the crisis of 1920.

However, first preferred stock was increased by \$2,000,000 during this period.

while largely balancing them was the item (\$7,230,000) of "profit and loss" on the asset side!¹

The difficulties of the United States Worsted Company seem to be at least two. First, it has lacked any man with the organizing and administrative ability of Mr. William M. Wood of the American Woolen Company. This was apparent long before the disaster which followed 1920. A very suggestive and appallingly frank statement occurs in the Company's report for 1913:

Looking back on the past year, it would seem that a great deal has been accomplished toward reestablishing the United States Worsted Company in the confidence of the trade. The Company, for various reasons, such as the nondelivery of goods as purchased, poorly manufactured goods, unsatisfactory deliveries, etc., was in very bad repute with the trade. The salesman had to show United States Worsted goods with an apology, and in many cases customers would not even look at the samples of the merchandise, saying that the samples would probably not represent the goods that were to be delivered.²

And since that time the quality of management has in a considerable measure brought difficulties on the selling side, according to conservative opinion in the trade. It has been necessary to manufacture an unusually wide range of fabrics, in relatively small lots, and to sell to concerns whose standing was not of the best. It is reported, for example, that one of the unsatisfactory features in the status of the Company after the crisis of 1920 was its inability to secure indemnity for broken contracts from the buyers with whom it had been dealing; though, to be sure, the clothing trade as a whole has been long afflicted by the evil of frequent cancellations. The real source of the trouble, again according to opinion on the street, has been something of the "just as good" or "almost the same" policy which was reported by the Company itself in 1913.

¹ The market price of the Company's first preferred stock which had touched 101 in September, 1918, and 93 in December, 1919, fell to 6½ by December, 1921.

More recently, a scheme for another reorganization of the Company has been prepared, apparently with a large measure of advice from the bankers and a representative of the banking interests will have a place as treasurer of the renewed enterprise (*Textile World*, December 16, 1922, lxii, 3431).

² *American Wool and Cotton Reporter*, xxviii, 344. Curiously enough "good will" was at that time carried on the Company's books at a figure of over \$4,000,000, — nearly as large as that for real estate.

A second factor is of more general significance, though in a measure connected with the above situation. The United States Worsted Company seems to lack the backbone of strength derived from a large production of staple fabrics; or, at least, it has not maintained the proper balance between the production of such standardized goods and that of goods in which style is the important factor. Soon after the establishment of the Company, it announced its intention "to run out an entirely new line of high-class novelty goods;" and in a later description of its products the emphasis was distinctly upon the fine and fancy character of the fabrics: "fancy worsted men's wear, fancy woolen men's wear, fine dress goods, broadcloths and worsted trouserings, serges, etc."¹ Moreover, in the equipment of the Company's plants, there is a considerable proportion of French worsted in the total worsted spindlage. This variety of worsted spinning is adapted to the finer, soft, drapy fabrics for women's wear, but the manufacture and use of the yarns produced under this system seem to me technically unsuited to economic conditions in this country, — at any rate less well suited than production and utilization of yarns of the English type. Not only is the production per worker lower, but the type of fabric turned out is one specially subject to competition from foreign manufactures.²

Combination in the American wool manufacture is of significance for at least three special reasons. First, the experience of the American Woolen Company has demonstrated that this form of industrial organization may be attained in the textile industry with a fair amount of success. The apparently close connection between combination and frequent reorganization, which has appeared in the cotton combinations, is not inevitable. The "big company" has been able to maintain, improve, and extend its organization, until it is "unquestionably the dominant factor" in the American wool-manufacturing industry.³ It has estab-

¹ *American Wool and Cotton Reporter*, xxiii, 940; *ibid.*, xxvi, 1368.

² See above, p. 84; also my analysis in *Quarterly Journal of Economics*, xxxvi, 122-123.

³ *New York Evening Post*, October 6, 1923; article by Carlton A. Shively.

lished and maintained a high measure of efficiency, and its labor and marketing policies have been a driving force in the industry. While the exact measure of its early financial success is and seemingly must remain problematical, still it has never been in danger of dissolution or reorganization, and by conservative management in the distribution of its profits and in the building of its mammoth new plants, as well as by the fortunate acquisition of new capital just before the crisis of 1920, it has been able to buttress its financial position and free its future from the threat of immediate disaster. Likewise, in so far as the problem of the American Woolen Company has been that of large-scale operation, the experience of the Cleveland Worsted Company goes to substantiate the fact that such operation is possible and profitable in the American wool manufacture. In only less degree, the success of other groupings of mills, such as that around M. T. Stevens & Sons Company, bears witness to the same effect.

The experience of the American Woolen Company is of added interest, since no combination of its particular character has been developed abroad. The woolen branch of the wool-manufacturing industry in foreign countries embraces no combination of moment; and in the worsted branch, probably by reason of its extensive differentiation there, combination has been of a limited variety, comprehending concerns which carry out a single process or at least only a few related processes. The Woolcombers, Ltd., and the Bradford Dyers' Association may be instanced in the English industry, and in the German manufacture the numerous cartells that have arisen in the various wool-working districts.¹ On the other hand, there are, at least in the English industry, several cases of agglomerations or the development of large-scale management, such as the Cleveland Worsted concern in this country. Men of outstanding ability, as, for instance, Sir Francis Willey and W. C. Gaunt, have gradually acquired miscellaneous

¹ In addition to the more definite combinations in the British trade mentioned in the text, there are frequent rate or price-fixing associations in various sections of the industry, e. g., the carbonizers' association, the commission weavers' association, and the blanket manufacturers' association.

For the German situation as it existed prior to the war, see Bachmann, *Organisationsbestrebungen in der deutschen Tuch- und Wollwarenindustrie*.

groups of wool-dealing and wool-manufacturing plants, until their enterprises now stand out as important factors in the British industry.

Finally, the history of the American Woolen and of the other consolidations suggests the essentials for advantageous operation of this industrial form. The American Woolen Company, like the United Fruit Company, has been essentially a one-man concern, and only a man of extraordinary executive ability and sound judgment could develop either company in the way it has been developed. In exceptionally good management the Cleveland Worsted Mills Company has also shared. Second only to this personal factor is the possession by the American Woolen and Cleveland Worsted companies of a large output, a substantial backbone, of standardized or semi-standardized products, and the refusal of the companies to go far into the manufacture of more speculative fabrics where style is the important element. It is worth while to note once more that such staple products are of greater prominence in the worsted than in the woolen branch of the industry. Perhaps for this reason no large-scale operations have been attempted in the woolen branch alone, — a fact which in itself would tend to support the contention here made of the importance of staple products to large-scale operation and successful combination. Perhaps without the two essentials above indicated, few "combinations" have ever been successful.

It is noteworthy, however, that these organizations in the wool manufacture have had none of the advantages, artificial or otherwise, to which Professor Jones attributes in large measure the success of other combinations with equally fortunate experience.¹ They have enjoyed no significant patent or copyright monopolies; they have no basis in the control of limited natural resources; nor have they been recipients of transportation favors. Furthermore, it can hardly be maintained that they have derived any appreciable strength from that final factor in Professor Jones's category, the possession of a specially efficient plant among its combined establishments, such as the Carnegie works in the steel combination, which would to a considerable extent

¹ Jones, *The Trust Problem in the United States*, pp. 539-541.

swing the whole enterprise. Indeed, it is the more remarkable in the case of the wool-manufacturing organizations that, lacking any of these favorable factors, they have still attained as substantial success as they have.

In so far as the foundation of success in these various concerns has been exceptional leadership, persistence of large-scale management cannot be assured. The dominant personalities must some time pass on, and perhaps their carefully reared enterprises will crumble with their going. But there appear to be more stable bases in support of these large concerns. The advantages of large-scale operations, e. g., in buying wool and selling the manufactured product, which have appeared from time to time in the foregoing discussion, presage a maintenance of the established organizations; the significance of standardized production, if rightly read, will give strength to their competition; and the trend of the whole industry over a considerable period suggests the suitability of such large units in management at the present period of industrial development in wool-working.

CHAPTER XXXIII

CONCLUSION

THE wool-manufacturing industry of the United States in recent years has been characterized by maturity, even as the cloth-making factory a half century earlier had then reached maturity of growth. No longer was the manufacture as a whole undergoing conspicuously great change. In many lines something like a ripe fullness of development had been attained. The Industrial Revolution as far as the wool manufacture was concerned had ceased to yield revolutionary changes.

The retardation of technical improvement, for example, is noteworthy and symptomatic. Advances, to be sure, there were in the period after 1870, but such advances were chiefly the slow-paced affairs of an industry well along in life. Exceptions to this situation consisted mainly in the introduction into the United States of machinery already well-known in Europe, and in the independent development of the automatic loom. Likewise, the reaction in favor of the woolen manufacture after two or three decades of marked trend toward worsted-cloth production, the reaching of fairly constant relations in geographical distribution of the industry, and the capture by the wholesale clothing manufacture of nearly the whole domestic market for wool clothing,—these all indicated the real maturity of the industry or relative stability of the conditions under which the industry operated.

The scale of manufacturing units within the industry is also an important feature in this regard,—a feature, however, which must be considered in connection with the quality of domestic production. In the woolen branch of the industry, there has come a material increase in the size of the representative concern over that which represented the normal in 1870. This is attributable to the enhanced localization of the manufacture and to the advance in standardization among woolen fabrics. Yet, the

scope of the usual woolen mill, and especially of the manufactory of fine fabrics, is small; and it gives no clear forecast of any considerable future increase. Except for change in the methods of manufacture or in the nature of fabrics demanded, the size of the representative woolen mill has become pretty well stabilized. Again, for the integrated worsted mill, no further enhancement in size is probable. Between 1870 and 1920, to be sure, a pronounced increase in scale of operations for such a mill has taken place; but a limit of advantageous size has been reached. No more Wood Mills will be built, in all probability; and the normal establishment for the future, while materially larger than that in the woolen branch, will be smaller than this huge affair of the American Woolen Company.

The difference in size of representative integrated establishments in the two branches of the manufacture, while flowing in considerable part from differences in nature of the productive processes, is also caused in part by the adaptability of worsted products to standardization. Since worsted manufactures — yarns, men's-wear cloths, and even some dress-goods — are subject to this feature of standardized production, manufacture may be conducted upon a large-scale basis. Indeed, the existence of standardized output is in a considerable measure responsible for the retention of integrated enterprises in the domestic worsted industry. In the manufacture of fancy goods, not only is the scale of operation smaller but differentiation is more common. And yet here the large scale of production in the wholesale clothing industry comes in to affect the organization of the cloth manufacture. Differentiation is carried less far, and the size of the specialized establishment is reduced less considerably, by reason of the relatively large unit orders received from the makers of clothing for the ready-to-wear trade. Goods made for the wholesale clothing trade must be uniform in character, whether the quality be high or low. And the effect of this factor is evident in the relative size of establishments making fine men's-wear goods and those turning out fine dress-goods. The trade in high-grade garments for men has secured less complete command of the market for men's needs in clothing than has the corresponding

trade in garments for women's wear; and accordingly the mills for the manufacture of superior cloths for men's clothing have reached a less considerable scale of production than concerns turning out fine dress-goods.

On the whole, the size of the representative cloth-manufacturing mill in this country is notably larger than that of corresponding establishments abroad. This is more particularly true of the worsted branch of the industry. Specialized spinning or weaving and finishing mills average greater size than similar concerns in England or on the Continent; and nowhere are there integrated mills comparable with those producing huge quantities of goods for the American market. It is no accident that the domestic industry possesses the largest woolen and the largest worsted mill in the world.

Finally, one may note that in quality of output the domestic industry now covers substantially the whole field. While importation of fine fabrics still continues in material volume, especially for employment in the custom-tailoring trade of men's garments, this proceeds in part through force of habit and prejudice. Some cloths as high in quality as any produced in Europe are turned out in American mills, and for the dress-goods end the production is in quantity largely sufficient for the domestic clothing trade. To be sure, only by the assistance of high protection is such manufacture maintained; and yet the establishment and even partial acclimatization of this production within the United States are distinct achievements.

PART V

CRITICAL ANALYSIS

CRITICAL ANALYSIS

As the course of this study has indicated, the history of the American wool-manufacturing industry is viewed here as the engrossing life-story of a primary domestic manufacture. From the simple and trifling production of wool fabrics in the Pilgrim homes, the industry has grown until it employs 180,000 persons, consumes annually 200,000 tons of raw materials, and ranks second among the important textile manufactures of the United States. The infant surely has become of surprising stature. Moreover, in place of the uniformly coarse and artless output of colonial looms, a multitude of different fabrics now flows from the doors of our spacious mills, — fabrics ranging in accordance with the needs of consumers from goods nearly as crude as those wrought up three centuries ago to textures that compare favorably with any produced elsewhere in the whole world. And yet, to the general student, increase in mere size or in diversity of production is not startling for an industry domiciled in a country which has expanded so rapidly and grown so wealthy as has the United States. To him other features are of greater import, especially the novel and original elements in the way of industrial forms, American contributions to technical equipment, and the adaptation of the manufacture to economic conditions peculiar to the United States.

The history of the domestic wool manufacture serves to bring into clear outline the fact that the series of industrial forms into which an industry is cast from time to time in its development cannot be assumed to be the same as that in the same industry in other countries or of another industry in the same country. Even in the growth of the manufacture in different parts of a given nation, the course of development may vary. There is no uniform and definitive rule. To be sure, the wool manufacture in the United States like that in all countries began in the household production, but the duration of this stage in the eastern

part of this country was much greater than that in communities farther west. Again, the particular significance of the fulling shops, and later of the carding-fulling mills, was special to American development. Such establishments existed in England, and possibly in other European countries,—the evidence as to the combined form is not clear with respect to the latter,—but they played a rôle of much less importance in relation to the household production. Here the period of household manufacture was markedly prolonged by reason of the assistance which these shops rendered, the individual household on the country-side being enabled to combat more effectively town production, importations, and the output of the budding factory.

The handicraft system of manufacture, on the other hand, was singularly minor in importance throughout the American evolution. Handicraft weavers early put in appearance, and they served valuably in the colonial period and in the early decades under the new government. The worsted-cloth makers of the same era were workmen of similar type, and the proprietors and operators of the above-mentioned fulling mills and fulling-carding shops might be included as well. Then, as the factory was rising, came a few men who carried on the whole process of cloth manufacture in little sheds or in their own homes. These, too, may be denominated handicraftsmen. But, on the whole, the phenomena were of slight significance compared with the long dominance of this industrial form in Europe,—concerning which we may recall the “master clothiers” of Yorkshire, the hand combers and worsted weavers in England and on the Continent, and the regime of guild control which, based on the handicraft organization, prevailed for considerable periods in most European wool-working centers. The handicraft system in the United States never played a conspicuous part, and never advanced beyond the elementary stage supplied by isolated hand workmen.

The putting-out stage of industrial development, another stage generally recognized by writers on the subject of industrial forms, was even less evident than that of handicraft in the course of American evolution. The English system of domestic or putting-

out work — the central shop and the employment of specialized out-workers — never raised its head in this country. The only cases savoring of such an industrial method that I have discovered were a few instances of spinning upon order, a particular affair of cloth manufacture at Pittsfield, Massachusetts, during the War of 1812, and rather frequent examples of domestic weaving in the early days of the factory system. On the whole, however, these cases are unimportant, and with the exception of the Pittsfield incident, are not examples of the pure and bona fide putting-out methods. Spinning upon order and the weaving of materials supplied by the young factories are merely outside piece-work ancillary to other industrial forms; and even this type of work had so little real influence that it may be disregarded.

Indeed, the factory method of production was for the most part a step direct from the household system, and in the early days the two were immediate competitors. Even the particular course whereby the new mills not infrequently came into existence is intimately connected with the household manufacture. The carding-fulling shops, which gave marked support to fabrication in the homes of consumers, served as convenient nuclei around which the new factories could form, while a continuance of the commission work for the household producers gave strength to the young concerns whereby they could withstand the trials of the first few years. This special line of evolution, it may be noted, is to be found, as far as I can ascertain, in the development of no foreign wool manufacture. Some American factories, to be sure, rose from the little sheds of the handicraft cloth-manufacturer, or started full-fledged as complete units; but the growth through the other course is sufficiently common to justify its place as the first typical manner of factory development. Again, with respect to the early factory system, the hesitant way by which it learned to stand on its own feet is noteworthy. I refer not only to the prolonged relations with the household production, but also to the frequent dependence of the new mills upon outside help in weaving and the exchange of cloth for wool or other local products, which these early establishments rather often encouraged. Only by slow steps did the modern factory

arise, self-contained and producing for a distant, impersonal market.

With respect to the whole development in form of producing enterprise, however, there is one general feature worthy of remark. As the household manufacture tarried a shorter time in the West than it had in the eastern areas, so in the rise of the western factory, changes came more quickly. The handicraft workers apparently were less numerous, the early western regions being perhaps too sparsely settled to encourage the rise of such workmen; and no evidence indicates the appearance of the putting-out system. The factory, moreover, came more rapidly upon the heels of settlement than it did in the East, though perhaps remaining longer dependent in greater or less degree upon custom of the local consumers.

With the attainment of the factory form, there came a long period of inaction as far as industrial organization is concerned. The factory grew from a small affair to a sizable establishment, and went through the vicissitudes of the Civil War and of diverse changes in tariff conditions. Only after the development of industries dependent upon the wool manufacture for semi-manufactured goods, and after the expansion in variety of fabric production, came the advent and extension of differentiated mills, — specialized combing and spinning establishments, with a few commission weaving and dyeing concerns. Again, only with the acquisition of large-scale manufacturing operations and with the nation-wide control of the domestic market did combinations put in appearance. Both of these newer events suggest the greater maturity of the American industry, representing changes in the organization of the whole manufacture rather than changes in the form of individual producing unit.

Furthermore, it is noteworthy that differentiation has not proceeded by any means so far in the American as in most foreign manufactures. Especially interesting are the large American worsted mills of the integrated type (for woolen mills the world over are customarily of this form). In England or on the Continent, specialized worsted combing, spinning, weaving, and finishing concerns are the rule; but in the United States the field is

divided between differentiated and integrated enterprises, the latter still supplying a large proportion, probably a majority, of the total domestic production in worsted goods. And the difference between domestic and foreign conditions seems to lie in the difference in the character of American output, the much greater degree of standardization and large-scale production in the manufacture of domestic fabrics. In that, the large mill working the wool from scouring to finishing has a considerable advantage over a group of specialized concerns. From this situation, again, it follows that the nature of American combinations differs from that of combinations abroad. Nowhere in the world is to be found an amalgamation of producing units comparable with the American Woolen Company; and concerns like the Cleveland and United States Worsted companies are rarely encountered. Combinations and price-fixing associations, to be sure, are frequently to be run upon in foreign wool manufactures, but they are affairs of the so-called horizontal type,—combinations among concerns of similar nature, all worsted spinners, all blanket weavers, and the like. But the American Woolen Company is for the most part a combination of integrated mills, while the Cleveland or United States Worsted enterprises are chiefly consolidations of mutually complementary establishments. As in most aspects of industrial form, therefore, the American experience in the realm of "trusts" is distinctive and individual.

American environment, however, has been responsible for more than peculiar developments in the matter of industrial organization. Quite as notable are the contributions made by American ingenuity to the technical equipment of the industry. Here one's mind reverts particularly to the original devices evolved in the early period when the machine processes of manufacture were being adapted to domestic conditions. We recall the improvements in gassing, shearing, and fulling apparatus as typical examples of American inventiveness. The harnessing of spinning and that of weaving to power operation — steps taken independent of foreign advances along similar lines — are likewise noteworthy. But perhaps most interesting and suggestive of all in these earlier days was the reformation of the carding

process, the development of the "carde Américaine," with which Goulding's name is especially associated. This was more than a mere improvement over preceding apparatus designed to accomplish the same purpose. The whole course of advance in the woolen-cloth fabrication, the essential character of the manufacturing process, was changed. The function of the slubbing process, carried through on the "billy," was akin to that of the drawing operations in the worsted branch. Had the slubbing process been retained and the billy perhaps improved in time, the method of woolen-yarn production might have been altered until it approached that of the worsted-yarn manufacture, — even as the so-called Belgian system of woolen-yarn manufacture, evolved more recently, approaches the method of worsted-yarn construction.¹ The introduction of Goulding's condenser committed the woolen industry definitely to another line of advance, — confirmed the woolen industry in the fabrication of cloths similar to those which theretofore had always been the typical output of that manufacture. Further impetus along this line, to be sure, has been supplied by the intermediate feeding apparatus of the carding process, which has been devised in subsequent decades; but the Goulding invention was unquestionably the turning point. Indeed, it ranks with the carding machine itself, the jenny, the loom, and the fulling mill as an epoch-making innovation.

More recently the contributions to technical progress attributable to American genius have been less considerable, although by no means unimportant. In significant portions of the manufacture, as, for example, scouring apparatus, the woolen mule, and the whole complement of machinery devoted to worsted-yarn preparation, the basic ideas and often the apparatus itself have come from abroad. Notable exceptions to this general statement are the automatic feeding device for the first stage in the carding operation and the refinements in condensing ma-

¹ The Belgian system of woolen-yarn production, employed somewhat in a few American mills, consists essentially in the treatment of woolen materials in the manner which will induce as great a parallelization of the individual fibers as is possible, — in short, a treatment on the worsted principle. The difference lies in the failure under the Belgian system to eliminate the short fibers.

chinery at the conclusion of that process, methods of conveying materials about the mill, the varied improvements in weaving apparatus, and particularly the introduction of the automatic looms. These varied American contributions have meant distinct enhancement in the productivity of the industry for the whole world, as the considerable adoption of these devices abroad goes to indicate. Moreover, as compared with contemporaneous developments in other wool-manufacturing countries, the American record is one of which the domestic industry need not be ashamed, — especially when account is taken of the general, world-wide tendency toward less rapid improvement in technique. On the other hand, one may regret that American mills have not always kept abreast of the numerous advances made in other wool-working industries, — the "*métier continu*" for woolen-yarn spinning so widely employed on the Continent, the automatic doffer for worsted spinning-frames, the fast over-pick loom, and the like.¹ Whether these failings are attributable to an enervating influence of high protection or to the inertia which impedes any modification of well-established practice, cannot be guessed. Possibly another factor is more important still, — the large scale of operation to which American plants have so commonly attained. In large plants both the heavy investment and the somewhat rigid organization put obstacles in the way of experimentation with new or strange devices. Whatever the cause may be, at least there is hope of an improved situation by reason of the appreciation by the wool manufacture of its relative position in this regard, and of an enhanced interest — perhaps not unrelated to the recent upward tendency in wages — among mill-men in technical considerations.

Contributions toward improved technique flowing from domestic sources have almost uniformly been in the way of increas-

¹ See above, p. 100, note 3. While there are quite a few over-pick looms in the American industry, more considerable adoption would probably follow more insistent efforts by domestic manufacturers to overcome the dislike of the operatives for such machines. It may also be noted that automatic doffers are not unknown in the American industry, but not only have the chief efforts in their improvement been made abroad, but interest in the device has until recently been quite distinctly keener there than in this country.

ing the production per worker and toward large-scale operation in the mills. Even as the American manufacture has not taken kindly to, nor supplied improvement in, such mechanisms as hydraulic presses, so also machinery particularly adapted to the production of the finer qualities of manufacture — such as the tape-condenser, improved combs, and the whole French system of worsted-yarn production — has come chiefly from abroad. When the domestic mills went into the fabrication of higher-grade goods, they did so by aid of borrowed apparatus. Even in the recent decades, the characteristic American developments, as in the adaptation of automatic weaving, have been such as would conduce primarily to a larger output per operative.

A third field in which the influence of American economic conditions may be noticed is that of the character of goods produced. In the colonial days, for example, the fabrics yielded by domestic manufacture — then chiefly manufacture in the literal sense — were coarse but serviceable goods for the most part. Only in the towns of the later colonial era was production directed to anything finer than the "home-spun," "sheep's-gray," and cloths of similar sort; and the worsted-cloth manufacture of the town handcraftsmen was no substantial proportion of the total domestic cloth supply. Meanwhile, however, the production of superior woolen and worsted fabrics had secured considerable hold upon European, and especially upon English, wool-working industries.

The middle periods in the history of the American industry, through the Civil War, reflected also the control which the underlying economic situation had upon the domestic manufacture. After an early fling at the production of the finest fabrics known, especially broadcloth, — a fling induced, to be sure, by peculiar circumstances of the time, — the American mills settled down to the fabrication of cloths more closely suited to American consumption. The institution and widespread production of cotton-warp fabrics, particularly satinet, is illustrative of this trend. Subsequently came the more general manufacture of flannels, of cassimeres, — including the so-called "fancy" cassimeres, — and of diverse other medium-grade goods. Even in the worsted branch, when fabrication of combed-wool cloths was commenced,

the article initially attempted was a fabric of plain, medium-grade quality, the mouseline-de-laine. Such production came to be the predominant type of output in the domestic industry,—a production which the manufacturing technique of the American mills and the expansion of the American market under the influence of the growing wholesale-clothing trade tended ever to enlarge.

The more recent decades of development are noteworthy for two reasons. First, standardization of fabric has become a characteristic feature of American production, being in fact carried further in the United States than in any other wool-working country. The beginning of this movement probably antedates the modern period, blankets, flannels, and possibly one or two other wool fabrics being turned out in nearly uniform types before the Civil War. But the more important advance has come later. Here the influence of the clothing manufacture — much further developed in the United States than in any foreign country — has been particularly significant by reason of its demand for large quantities of homogeneous goods. That manufacture has demanded goods which it could show to its customers with assurance that any required quantity of identical garments could be made up, that is, garments of identical fabric as well as identical cut. The pressure upon the cloth-making industry, then, has been toward production of uniform goods. And the desire on the part of the clothing manufacture to be able to fill "repeat" orders from their patrons and to run standard season-to-season styles has worked in the same direction. Again, the capacity of the new worsted manufacture for the production of standardized goods, a capacity greater than that of the older woolen branch, was of marked value, accounting in part perhaps for the peculiarly rapid extension of the former manufacture in this country. The technical characteristics of the worsted processes — use of a single type of raw material in yarn construction, the elimination of short fibers in the combing process, and the like — are here responsible for the special facility in uniform production. Then, too, labor conditions in the American wool manufacture have been such, especially the conditions imposed by the influx of the

“new” immigrants and by their restiveness, that advantage has flowed to the manufacturers who concentrated their efforts upon the production of the common, standardized fabrics.

Yet more recently still has risen the fabrication of distinctly fine-grade cloths, — a fabrication, moreover, which, at least in dress-goods, takes place upon a really large-scale basis. That manufacture in the higher ranges of quality should have been attempted is attributable largely to the enhanced level of the protective tariff combined with the increase of productive efficiency in domestic mills and the increased domestic demand for such commodities. Without the aid from all of these factors the new advance in higher-quality production probably could not have taken place. But these forces do not account for the manufacture on a large-scale basis, which, it may be observed, is a distinct peculiarity of the American industry. While European production of similar fabrics has proceeded in small mills and upon relatively small orders for any one type and quality of goods, American manufacture has become connected in a substantial degree with truly sizable establishments and proceeds upon orders running into the thousands of yards per type and quality. This striking difference flows from, and is caused by, the difference in the marketing conditions for such goods in the two areas, that is, the much greater dominance in the United States of the wholesale clothing industry over the supply of wool garments, and so the greater significance of that industry in the purchase of wool fabrics. The fact that large-scale operations have become more important in the American manufacture of superior dress-goods than in the domestic production of fine men’s-wear cloths is similarly due to the greater prominence of the wholesale clothing industry in the supply of fine-quality women’s garments than in that of high-quality men’s clothing. To be sure, the production of high-grade fabrics even on a large-scale basis is carried on at high cost compared with that of lower-quality goods, and surely it is dependent in an exceptional degree upon the support of the tariff. Yet, as I have suggested before, the attainment of so large and so excellent a manufacture of cloths in the upper ranges of quality is a particularly noteworthy accomplishment,

— especially noteworthy in view of the character of the labor supply with which domestic manufacturers have had to work and of the general inexperience of these manufacturers themselves in this sort of production. From a still wider point of view, the achievement is also deserving of attention. High quality in output and large-scale operations are usually considered to be incompatible, and yet the two are here in a measure combined.

In summary, then: on at least these three points, the form of the producing unit, the character and number of contributions to technical equipment, and the adaptation of the quality in output to underlying conditions, the history of the American wool manufacture is particularly worthy of study. That industry has met the conditions imposed by American economic life and made a place for itself in the front rank of domestic business. Such a consummation by virtue of its own importance merits the long analysis into causes and avenues of development which has here been made. But in another, broader aspect the value of this analysis is further enhanced. While the solutions which the wool manufacture has found to the problems confronting it are in some measure peculiar to itself, students of American industrial history will recognize that its experiences are largely representative of the evolution in all American industries. Even as Morris and Wood in their little volume "The Golden Fleece" have essayed to picture the course of English economic history by tracing the vicissitudes of the British wool manufacture, so an historical survey of the American wool-manufacturing industry brings out the chief developments in our own industrial advance. The struggle of factory production to get a foothold, the application of American intellect to the improvement of technical processes, the gradual rise in quality of output, and the dependence of the manufacture in substantial measure upon standardized production of medium-grade goods, — these are events and tendencies common to many branches of domestic industrial enterprise. The intimate study of this single manufacture, therefore, is doubly justified. In the history of a single tree lies the history of the forest.

APPENDICES

APPENDIX A

THE WOOLENS ACT OF 1699

THE origin of the Woolens Act of 1699 has sometimes (*Census of 1860*, iii, p. xxviii) been said to have been the suggestion of Governor Nicholson of Virginia in 1698 to prohibit the making of cloth in the colonies (Bishop, i, 322). It seems improbable, however, that this recommendation alone carried much weight, especially as the Board of Trade did not in fact go so far as that in its report to the House of Commons. Rather, it appears, as stated in the text, that the more urgent demand for legislation respecting the Irish industry gave the convenient opportunity for some restrictive measure relating to the colonial manufacture, concerning which considerable information, accurate and inaccurate, already existed in England.

In estimating the position that the colonial industry held in the mind of the Parliamentary legislators, the title of the act is significant: "An Act to prevent the Exportation of Wooll out of the Kingdoms of Ireland and England into foreign parts; and for the Encouragement of the Woollen Manufactures in the Kingdom of England." In other words, the application to the colonies was not of sufficient weight to be noted in the title. Indeed, the article pertaining to the colonies is appended to eighteen dealing with Ireland alone. Again, as has been intimated in the text, these eighteen articles are of a much more stringent character than the lone one respecting the "Plantations," — restricting the ports in England to which shipments might be made from Ireland and providing for naval patrols to secure efficient enforcement and to prevent smuggling. Finally, it may be noted that petitions to Parliament at the time made mention only of the Irish situation (*Journal of the House of Commons*, xii). Taken with the half-casual recommendation of the Commissioners for Trade that "upon Occasion, the like Prohibitions be made with relation to those Northern Colonies as to Ireland," it is obvious that the provisions involving the colonies were indeed merely incidental, added at this propitious time to widen the scope of a bill already in contemplation and thus to cover and check a possible future competitor of unpredictable strength.

The juxtaposition of the colonial provisions also leads to another consideration: that they cannot be interpreted apart from those in regard to the principal area involved in the act, namely, Ireland. There it cannot be doubted that the "true Intent and Meaning" of the law was wholly concerned with exportation. The Irish had been shipping cloth into the neutral markets of the Continent, where it competed with the much cherished English goods to the (at least immediate) disadvantage of the latter; and to the stoppage of this traffic the legislation was directed. To that purpose it was enacted that no one "shall directly or indirectly export, transport, ship off, carry or convey, or cause or procure to be exported, transported, shipped off, carried or conveyed out of, or from the said Kingdom of Ireland" any wool or wool goods of the list subsequently enumerated as regards the colonies; nor shall any one load these wares upon any Horse, Cart, other Carriage, Ship or Vessel, "to the Intent or Purpose to export, Transport," etc., etc. from the said Kingdom (Article I). Nothing, however, in all the provisions of the act pertained to any check upon the movement of goods inside the country. Indeed, one proponent of the bill wrote what was evidently the sentiment of the times: "The English will never deny them (the Irish) the Liberty of making what they themselves wear" (quoted in Smith, *Memoirs of Wool*, ii, p. 20). The inhabitants could ship from place to place within its shores, and were checked only from exporting to other countries, except under the stringent and definite regulations laid down in the law.

With this interpretation of the principal portions of the act in mind, what then can be deduced to be the "true Intent and Meaning" as regards the colonies? Obviously, the purpose was that each colony should be treated as a separate Ireland, free to manufacture and ship within itself but forbidden to export. Inasmuch as each colony was a quasi-independent community, it was necessary, in carrying out the same policy as had been framed for Ireland, to add a prohibition of shipment from one colony to another.

More in detail, the paragraph concerning the colonial situation comprises two prohibitions. One forbade the loading of any wool or wool manufactures of colonial production upon "ships or vessels;" and to guard against deception and smuggling it was enacted that such loading should not be performed "upon any Pretense whatsoever." Thus, in John Adams's phrase, neither wool nor woolens could be "water-borne" under any consideration. Secondly, no such goods

should be loaded upon a horse or vehicle with the same general purpose in view, namely, "to the Intent and purpose to be exported" or otherwise conveyed "out of the said English Plantations," to another of the said plantations or elsewhere.

Again, no one has pretended to assert that internal commerce in wool or wool products was restricted in Ireland. On the contrary, there is every evidence that the Irish trade was maintained, though in a depressed condition (Cunningham, *Growth of English Commerce*, ii, 379, note). A writer in 1747, in a rather partisan pamphlet, stated that "Ireland has since (1699) gone on, improving to the utmost of their Power, their Woollen Manufacture for home Use, and for Exportation clandestinely" (quoted in Smith, *Memoirs of Wool*, ii, 30, note). In like manner there is no contemporary evidence from our colonial experience to substantiate the statements of some modern writers, referred to in the text, that wool fabrics might not under the Woolens Act be made for local exchange or "for the public markets" (Beer, *Commercial Policy of England toward the American Colonies*, p. 77).¹

From all the data available, then, it appears that the importance of the Woolens Act as regards the colonies has been altogether exaggerated. The measure of prohibition was strictly limited, and, in view of the primitive form and small surplus or "disposable" production of the industry in America, this feature dwindles still further in significance. It was, in truth, merely another commercial regulation, like the "enumeration acts" which preceded and followed it. Like the Sugar Act, moreover, it affected internal production only indirectly, through the effect, intended by the legislation, upon foreign or external commerce. In so far, and only in so far, can it be called an act to check or restrain colonial manufacture.² Under the existing

¹ The only item in contradiction to this view is that of a method of evasion, by which the people, it was said, "carry their sheep from one place to another, and when they are shorne, bring them home again, leaving their fleeces behind" (*Calendar of State Papers, Colonial*, xix, 658). But several explanations are available: the act was not clearly understood (cf. Brinton's letter of 1703, quoted in Dicker-
son, *American Colonial Government*, p. 304); the statement referred to water trans-
portation (note the words "carry" and "bring"); or it referred to operations
taking place over the boundaries between colonies, e. g., Massachusetts and Rhode
Island, which were indeed forbidden by the Act.

² It may be noted that Ashley agrees in the main with this interpretation. He writes (*Quarterly Journal of Economics*, xiv, 13): "The object (of the Act of 1699) was to prevent all manufacture for a distant market, while not interfering with

economic conditions and the prevailing state of the arts in the wool manufacture, no appreciable development of the colonial industry could be expected. Curiously enough, however, the impression that somehow or other the British colonial policy was oppressive still continues. Thus, in an otherwise dispassionate and substantially accurate account of the colonial wool manufacture, Dr. Tryon interjects: "The artful policy impressed upon king and Parliament by the English manufacturers had kept the textile industry in the colonies far behind other industries" (*Household Manufactures in the United States, 1640-1860*, p. 117).

It may perhaps be added that opinion in England as to one portion of the Woolens Act was changing before the close of the colonial era in America. The prohibition of exporting the unmanufactured wool was seen by some writers to have been a mistake. In essence this restraint was contrary to the tenets of the Mercantilistic colonial policy, though it was of little consequence by reason of the fact that England was at the time a wool-exporting country and that the colonial wool was of inferior quality to the British. The later change in sentiment is discernible in Mitchell's statement in 1767: The colonists "have already Wool enough, which is as fit for their use as if it were finer, and the only way to hinder them to manufacture it, is, to improve it so as to make it fit to send to England, in order to purchase their Manufactures, instead of making them, and to supply the place of Spanish Wool; and if it were rightly set about, it might be easily done" (*Present State of Great Britain and Colonies*, p. 143).¹

Finally, attention should be called to the fact that the Woolens Act, as far as the prohibition of wool exportation was concerned, coincided with measures enacted by colonial legislators themselves. Reference has already been made above to the prohibition of the export of wool by diverse colonies; and it appears that similar restrictions were imposed from time to time upon iron, leather, and other materials (Clark, p. 23).

manufacture within the family, or for purely local needs." He also disagrees with Weeden, who, he remarks, "not observing that 'to any other place' in the Act is conditioned by 'out of the Plantations,' gives a very misleading impression of the purpose of the act." Ashley suggests that Weeden "was probably misled by the loosely worded account of the act in *Adam Smith*, Bk. iv, ch. vii."

¹ See also Clark, p. 23.

APPENDIX B

LIST OF FACTORIES STARTED BETWEEN 1800 AND 1815

Date	Location	Name of Company or Prominent Individual	Production
1799-1806	Montville, Ct.	Scholfield, John	
1800	Monson, Mass.	Monson Woolen Mfg. Co. (Incorp. 1812)	
1802	Andover, Mass.	Scholfield, James	Broadcloth
1806	Stonington, Ct.	Scholfield, John	
1806	Derby, Ct.	Humphreys	Broadcloth
1807	Poughkeepsie, N.Y.	Booth	Fine woolens
1807	Jewett City, Ct.	Scholfield, John, Jr.	
1808	Canton, Mass.	Beaumont	Satinet
1809	Lisbon, Me.	Mayall	
1809	Uxbridge, Mass.	Day	
1809	Northampton, Mass.	Shepherd	Broadcloth
About 1809	Danville, Pa.		
1809	Pittsfield, Mass.	Pittsfield Woolen and Cotton Co.	
1809-10	Pittsfield, Mass.	Housatonic	Broadcloth, kerseymeres, satinets, flannels, etc.
1809-10	Oriskany, N.Y.	Capron	
1810	Newport, Del.	M'Kinney	Cassimeres, etc.
1810	Andover, Mass.	Marland	Satinets, later flannels
1810	Harmony, Pa.	Rapp	Broadcloth
1810	Waltham, Mass.	Waltham Cotton and Woolen Co.	
1810	New Ipswich, N.H.	John Everett	Satinet (by 1815)
1810	Middletown, Ct.	Middletown Woolen Mfg. Co.	Broadcloth

OTHER MILLS, MENTIONED BY GALLATIN IN HIS REPORT ON MANUFACTURES (1810)

By 1810	Warwick, R. I.		Cloth
"	Portsmouth, R. I.		Cloth
"	Brandywine, Del.	(DuPont?)	Broadcloth
"	Brandywine, Del.		
"	Baltimore, Md.		Some broadcloth
"	Elkton, Md.		Cloth

By 1810	Frederick, Md.		Woolen cloths and mixtures
"	Philadelphia, Pa.		Cassinet
"	Germantown, Pa.		Coarse cloth and satinet
1810-11	Wilmington, Del.	DuPont and Bauduy	Superfine broadcloth
1810-11	Wallkill, N.Y.	Phillips	
1811	Hudson, N.Y.	Macy	
1811	Manhattanville, N.Y.		
1811	Rockville, Ct.	Abbott	Satinet
1811	Billerica, Mass.	Faulkner	
1811	Pittsfield, Mass.	Stearns	Woolen cloth, then satinets
c. 1811	Northampton, Mass.	Williams	Broadcloth, blankets, and narrow cloth
c. 1811	Plainfield, Ct.	Two factories: Lawton and Eaton	
1812	Montville, Ct.	Scholfield, John	Satinet
1812	Waterford, Va.	.	
1812	Dudley, Mass.	Merino Woolen Factory Co.	
1812	Dudley, Mass.	Village Mfg. Co	
1812	Providence, R. I.	Providence Woolen Mfg. Co.	Broadcloth
1812	Northbridge, Mass.	Eddy	Broadcloth, cassimere, and satinet
c. 1812	Providence, R. I.	Two small factories	
c. 1812	Salisbury, Mass.		
By 1812	Troy, N.Y.	Troy Cotton and Woolen Factory	
After 1812	Marietta, Ohio	Marietta Mill Co.	
1813	Andover, Mass.	Stevens	Broadcloth, then flannels
1813	Short Creek, Ohio		
c. 1813	Mt. Pleasant, Ohio		
1813	Torrington, Ct.	Wolcotts	Broadcloth
1813	Stockbridge, Mass.	Curtis and Bacon	
1813	No. Adams, Mass.	Tinker	Satinet and all wool cloth
1813	No. Adams, Mass.	Chittenden	Satinet and all wool cloth
1813	Goshen, Ct.		Broadcloth
1813	Billingham, Mass.		
c. 1813	Pittsburgh, Pa.	Arthurs	
1813	Douglas, Mass.	Cragin	Satinet
1813	Norton, Mass.	Norton Cotton Co.	Satinet
c. 1813	Baltimore, Md.	Franklin Co.	

c. 1813	Pittsburgh, Pa.	Cochrane	Blankets and flannel
1813	Salem, Mass.	Derby	Broadcloth
1813	Brandywine, Del.	Young	
1813-14	Stockbridge, Mass.		
1812-15	Lee, Mass.	Ball, Bassett, and Co.	
1812-15	So. Lee, Mass.		
1812-14	Andover, Mass.	Abbots	Flannel and cassimere
1812-14	Mendon, Mass.	Pitts	
1812-15	Goshen, Ct.		
1812-15	Greenwich, N.Y.	Eagle Woolen Mfg. Co.	
Before 1814	Middletown, Ct.	Crowninshield	
"	Foster, R. I.	Foster Woolen Mfg. Co.	Satinet
"	Lenvale, Del.	Clifford	
"	No. Killingworth, Ct.	Wilcox	
1814	Waterford, Ct.	Scholfield	
1814	Southbridge, Mass.	Charlton Mfg. Co.	
1814	Rockville, Ct.		
1814	Uxbridge, Mass.	Rivulet Mfg. Co.	Satinets, broadcloth, and cassimere
1814	Pittsfield, Mass.	L. Pomeroy and Sons	Broadcloth
1814	Dalton	Weston	Broadcloth
1814	Lexington, Ky.		Broadcloth, cassi- mere, flannel, and blankets
1814	Rockville, Ct.	Hockanum	Satinets
1814	Northbridge, Mass.	Northbridge Cloth Co.	Satinets
1814	Plimpton, Mass.		All wool goods
1814	Leicester, Mass.	Watson	
1814	Pittsfield, Mass. (?)	Elkanah Watson (?)	
1814	Windham, Ct.	Spafford	
1814	Union, Me.	Farmers' Woolen Factory	
1814	Kennebunk, Me.	Mayall and Radcliffe	Satinets
1814-15	Steubenville, Ohio		Broadcloth
1815	Dudley, Mass.	Slater	Broadcloth
1815	Miami County, Ohio	(Building)	Broadcloth

CERTAIN OTHER MILLS — DATES UNCERTAIN

Mentioned by Bradbury, *Travels*:

Nashville, Tenn.
Cincinnati, Ohio
Beaver, Pa.

Mentioned by Lippincott, *Ohio Valley*:

Zanesville, Ohio
Chillicothe, Ohio
New Lisbon, Ohio
Dayton, Ohio

APPENDIX C

DESCRIPTION OF PRESENT-DAY MANUFACTURING PROCESSES

THE two chief divisions of the wool-cloth manufacture are the woolen and the worsted. The differentiation between these proceeds chiefly on the method of treating the wool fibers during the processes of manufacture, especially in the preparation of yarns, — since the character of the final product is largely set by the time the wool has been worked into the yarn state. Another possible line of differentiation exists in the appearance of the finished goods. This is nowadays rather unsatisfactory, since in modern times clearness of division has disappeared. Worsted goods are too frequently finished to look like woolen. To be sure, there are some cloths which can readily be identified as woolen by their appearance, and others which are unmistakably worsted by the same token. But appearance is no longer a sufficient clue. The criterion first suggested is more scientific.

In the manufacture of woolen yarn, the processes aim at a thorough intermingling of the individual wool fibers. The arrangement of these fibers in relation to one another is a matter of secondary importance, although attempt is made to secure a fair degree of parallelization. If this latter provision is observed, the twist that is imparted in the spinning process will give adequate consistency to the completed yarn. Though the yarn produced by this method is weak as compared with other textile yarns, it is not without some advantages. It is a soft yarn, — a yarn that is bulky and is especially suited to the manufacture of heavy fabrics. The strength necessary for satisfactory cloth may be secured in the fulling process of the finishing operations, and yet the benefits of the loosely constructed, bulky yarn-strand may be retained.

Typical woolen cloths are notable for substantial heaviness of texture, sometimes accompanied by firmness, although, to be sure, some fine and dainty woolen goods are turned out. The weave structure is usually simple. Sometimes it is of so little consequence that it may be entirely obliterated in the finished fabric. The fulling may have broken up the constituent yarns or the gigging may have raised a pile-like nap

that conceals the arrangement of threads in the body of the goods. Where the weave is still apparent, as in tweeds, emphasis is rather upon the color scheme provided by the component threads than in the fineness of the interlacing. Important varieties of woolen fabrics are meltons and most other overcoating materials, broadcloths, blankets, flannels, cassimeres, tweeds, and homespuns.

In the production of worsted yarn, on the other hand, the processes are so arranged that the shorter fibers — those difficult to control — are discarded and the longer ones brought as closely parallel as possible. In the spinning operation, too, a greater twist is usually imparted. Whereas the woolen yarn is a bulky, loosely constructed article, the worsted yarn turns out a smooth, well-formed affair. Moreover, the greater average length of fiber, the arrangement of the fibers, and the application of more twist all aid in the production of a stronger yarn.

The finished worsted fabric is typically a smooth cloth with a clearly defined weave structure. It also has a sheen that usually is lacking in woolen cloth. Because of the orderly arrangement of the component fibers, the light is reflected from the serrations of the wool fiber whereas this reflection is broken up in the woolen cloth. These characteristics may be seen plainly in serges and similar fabrics.

By reason of the different aims in woolen and worsted-cloth manufacture, and of the different treatment of the wool fibers in the processes of fabrication, there is a difference in the character of material that can be employed in the two branches of the industry. Since the individual fibers are brought substantially parallel in the worsted manufacture, length of fiber sufficient to permit such treatment is necessary. Accordingly this branch of the industry must have wools at least two inches in length. Also it must have all new wool, since recovered wool fiber or shoddy will not run to that length of staple. On the other hand, the woolen-cloth manufacture does not aim at so great orderliness of the individual fibers, and so can utilize fibers of almost any shortness: short-stapled new wool, noils discarded by the combing process of the worsted industry, wastes recovered from the worsted branch, and shoddy derived from wool fabrics. The woolen operations can indeed employ any staple provided it is not too long, say, over five inches in length. Cotton, being generally of distinctly short staple, is more commonly mixed with the wool fibers in the woolen branch than in the worsted, to form what is called "merino" yarns. A certain amount of "worsted-merino" yarns, to be sure, is now turned out in the Ameri-

can industry, but "woolen-merino" yarns are much more important. The cotton used in the former type of yarn must be of the longer varieties, Egyptian and the like.

But the above-given generalizations as regards worsted cloths are subject to qualification since an important group of worsteds does not conform very closely to the character just described. These are the goods produced from yarns manufactured on the so-called French or Continental system. Here wools of somewhat shorter staple can be used, a larger proportion of short fibers is retained for manipulation than in the case of the Bradford system which I have described as the typical worsted process, and the parallelization is perforce carried less far. As a result, the yarns are fuller and softer than characteristic worsted yarns. In fact, they stand intermediate between the smooth, hard-twisted yarns of the Bradford system and the typical woolen yarns. In the soft, drapy dress-goods of recent years may be seen the characteristic fabrics yielded by this younger and less important branch of the worsted manufacture.

THE WOOLEN-CLOTH MANUFACTURE

For a brief description of the present-day methods in woolen-cloth production, the operations may be divided into five groups,—preparation of the wool, carding, spinning, weaving, and finishing. In the first group the purpose is to remove all extraneous matter from the wool fibers, leaving them in such condition that they can be readily worked in the subsequent processes.¹ The wool as it reaches the mill is usually

¹ Really the first process in the wool mill (woolen or worsted) is the wool sorting. This is essentially a part of the selection of the right material for the particular jobs that are in hand. For the manufacture of almost all fabrics, there must be a choice of the quality or qualities of wool fibers which for technical or financial reasons are best suited to the given tasks. Now the wool fiber as yielded by the sheep is far from a homogeneous article. Not only does it vary as between animals, but the fleece of a single sheep contains wool of quite variant qualities. The wool of highest quality grows on the animal's shoulders and back, the wool of the two sides is shorter and may be coarser, while that of the belly, britch, and lower legs is inferior still.

Separation of wool into the various qualities begins at the shearing sheds of the sheep station, where fleeces of roughly equivalent character are bunched together and where the coarsest and dirtiest portions of the fleeces may be removed—"skirted"—from the rest. The wool merchants may carry the process of selection and classification a step further, when wools may be rehandled and "classed"—i. e., put into groups of which the lines are somewhat more finely drawn. Indeed, the merchants sometimes actually "sort" the wool, or break up the individual

in the same condition as when clipped from the sheep's back, with dirt, vegetable material, suint or sheep's sweat, and wool grease all adhering to the wool fibers. (If the wool arrives at the mill in any other state, it means simply that one or more of the preparatory processes has taken place elsewhere — e. g., in a specialized scouring plant.) The wool is first loosened — the individual locks of wool separated — in order that the later treatment may be more efficiently accomplished. This is done in a "willow," picker, or similar machine, a simple apparatus consisting of a large box within which is a cylinder armed with spikes. The wool is fed automatically into one side of the machine, is thrown about by the rapidly revolving cylinder, and is at length expelled at the other side.

Of somewhat similar character is the burr-picker, through which the loosened wool is usually put to remove the dust, straw, and other vegetable matter adhering to the staple. The extraneous material is either drawn from the wool by means of a forced draft or knocked out of it by the action of rapidly revolving cylinders. Wool cannot be completely cleaned in this manner, but in many cases so small an amount of vegetable matter and dirt remains that it forms no obstacle to proper manipulation of the wool in the subsequent manufacturing operations. The residue can be eliminated by carbonizing the finished cloth, — a process to which most woolen fabrics are subjected.

The wool is then ready for the scouring operation. Scouring comprises the removal of the wool grease, suint, and dirt from the wool fibers. In this process, the wool is immersed in long troughs containing a mixture of water and soap, or of water, soap, and some potash or other similar chemical which will aid in the cleansing operation. Three or four troughs placed end to end with intervening rollers are usually employed. The flow of the liquid chemicals is so arranged that the wool enters successively cleaner fluid in the three or more bowls. In these troughs or bowls the wool is stirred about and pushed forward by long rakes automatically propelled. Finally it is presented to rollers by means of which it is drawn out of the bowls and squeezed relatively dry. Thereafter the wool is carried to the drying room or drying machine in which the excessive moisture is evaporated.

fleeces and separate the several qualities into special divisions. Then, finally, when the wool reaches the factory, if it has not been already satisfactorily treated by the wool merchant, it is sorted into the half-dozen or dozen grades as dictated by the needs of the particular establishment. "Off-sorts" or wool discarded by the worsted mill working on the Bradford system will find employment in the woolen or Continental-worsted factories.

If there is a large intermixture of burrs, seeds, and the like, the wool must be carbonized after it is scoured, as the burr-picker above mentioned cannot adequately treat such staples. The process of carbonization also consists of the immersion of the wool in a series of long troughs, though now the fluid there contained consists of a mixture of sulphuric acid and water. The wool is pushed along in the same manner as in the scouring operation, and at last is drawn out and squeezed between a final pair of rollers. Then it is placed in a hot chamber or is passed through a formal drying machine, whereby the acid is given opportunity to burn the vegetable matter which it has already impregnated. Subsequent passage of the wool through other rollers removes the dry ash. After immersion in a neutralizing bath, the wool is ready for the real manufacturing operations.

Unless the wool is to be dyed in the loose condition (that is, before carding and spinning) the first step is the preparation of the "mix."¹ The manufacturer has determined what proportion of the wools of several characters, of shoddy or reworked wool, and of cotton he desires to combine in the production of a given yarn or fabric. Raw materials of the preconceived proportions are then spread out in layers upon a large surface such as a floor. By taking away vertical sections of this pile, a beginning of the intermixture of the various materials is made.

The "mix" as it is taken away is thrown into a "mixing picker" by which the different sorts and grades of stock are further commingled, and thence into the hopper of the automatic feeding apparatus which stands before the first section of the carding machine. By means of this apparatus the wool-mixture is measured out and spread evenly upon the feeding apron of the carding mechanism. In American mills, this carding mechanism normally consists of three sections of somewhat equal size and similar character, called the breaker, intermediate, and finisher cards, or of one single and one double-sized section (double-breaker or double-finisher). These consist of one or two large cylinders covered with card-clothing, — leather studded with fine, crooked wire points, — and a number of small cylinders arranged at intervals about the main cylinder or cylinders and similarly covered with card-cloth-

¹ Dyeing may be accomplished while the wool is loose, when it has been converted into yarn (though this is in fact rare in the woolen branch), or when later it has been worked into cloth. In all cases the operation is similar, — the immersion of the material in a solution of coloring matter (vegetable or chemical), — though of course the apparatus differs in detail with the character of the material to be handled.

ing. Some of the small cylinders are made to revolve in the same direction as, and some in the opposite direction to, the principal cylinder or breast; and the speed at which the several cylinders move also varies. The general principle of the whole machine's operation is that the wool shall be drawn forward by the main cylinder, be taken off and restored from time to time by the small or working cylinders, and that thereby the mass of fibers shall be thoroughly loosened from one another and recombined into a homogeneous mixture. The mode by which the wool is transferred from cylinder to cylinder, — the teeth of one drawing or pulling the fleece from the teeth of the other, — tends to confer a certain amount of parallelization to the individual fibers. The degree of parallelism is not so great by any means as that achieved by the carding, combing, and drawing operations of the worsted branch — of which more shortly — but it is sufficient to give a moderate strength to the finished yarn.

Certain special features of the operation are worth notice. Before the wool reaches the main cylinder of the first or breaker card, it has to pass over a group of three or four small cylinders. These give the first opening of the tangled mass of fibers which comes from the scouring process. These small cylinders usually include a burr cylinder as well, by means of which small particles of vegetable or other foreign substances may be removed from wools that have not gone through the carbonizing operation.

Between the first and second, and between the second and third machines that comprise the three-part carding apparatus, and between the two sections of the other form, the wool is transferred by automatic devices called feeds. The usual type in domestic mills is the so-called Apperley feed. In this apparatus the wool is drawn from the final, doffing cylinder of the preceding breaker or intermediate card in a loose, rounded strand. This strand is brought overhead to the first or licker-in cylinder of the succeeding (intermediate or finisher) card, and placed upon the feed apron of this card in diagonal rows, i. e., in rows that run at a 45-degree angle to the line of the licker-in cylinder. This increases the mixing of the fibers, although, to be sure, diminishing the amount of parallelization imparted.

Finally, the wool, adequately worked, is drawn from the third or finisher card in small strands. Two types of apparatus are used. The more common type in the United States is that which embraces the ring-doffer mechanism, — the improved Goulding card. It operates as follows: The sheet of wool fibers as it comes from the last cylinder or

“fancy” of the carding apparatus is passed between two cylinders covered merely with strips of card-clothing in place of the complete covering by such clothing as in the case of the other cylinders. The strips run around — not across — the two cylinders and are divided by blank spaces equal in width to the strips. The arrangement of strips on the two cylinders is such that the covered areas on the one correspond with the blank areas on the other. When the sheet of wool fibers passes between these two cylinders, it is seized upon by the strips of card-clothing and divided into two sets of small ribbons of wool fibers, — the number in the two sets being determined by the number of strips on the two cylinders. Then the ribbons are doffed from the separate strips of card-clothing and passed through rubbing apparatus, whereby they are formed into loosely constituted strands of fibers. These are called ropings or rovings, and are ready for the spinning operation.

In the alternate device, called the tape condenser, the sheet of wool from the carding cylinder is split by means of narrow leather belts. Two sets of such belts are employed and run in pairs. Each pair takes a section of the sheet of fibers and, running in somewhat different direction from its immediate neighbors, separates the wool into strands after much the same fashion as the alternate strips of card-clothing on the ring-doffer method. Since the belts divide the narrow sections of the fleece more nicely, more strands may be secured by this tape condenser from a given width of wool-sheet.

The ropings as they come from the condenser are wound upon large spools and are ready for the spinning operation. The spools are transferred directly and placed upon racks behind the mules. The mule type of spinning machine, almost universally used in woolen spinning, is a complicated mechanism. It consists essentially of three parts, a stationary portion, a moving portion, and an intricate piece of apparatus called the head-stock which controls the individual and joint actions of the other parts. The ropings, coming from the spools that are set up behind the stationary part, are passed between rollers which form one element in that part, and are attached to spindles placed on the moving portion. At the commencement of the spinning operation, the moving part or carriage is drawn close to the fixed part. Then as action begins, the roping is paid out by the rollers just mentioned at a rate which corresponds exactly with the speed at which the moving part is being drawn away from the stationary portion. When the moving part or carriage has gone through some proportion of its total traverse — a half, three-quarters, etc., according to the degree of drawing

or drafting that is desired — the rollers cease to give out roping. The carriage continues its outward movement, though at a reduced pace. Meanwhile, the spindles of the carriage have been revolving at a pre-determined speed, — a speed which is accelerated when the rollers quit paying out the material. In the first part of the carriage's traverse, no drawing-out or drafting of the roping takes place and only sufficient twisting to give the necessary strength to the extended strand. In the latter part of the carriage's traverse, however, the roping is drawn out or drafted, — in the proportion set by the continued movement of the carriage after the rollers have ceased to pay out material, — while the action of the spindles gives it additional strength through the increased twist. The synchronous drafting and twisting is of advantage, since then the strengthening twist tends to run into any sections of the roping which are weakened through the drawing operation. Finally, when the carriage has reached the end of its outward movement, the rapid action of the spindles is stopped; the carriage is drawn back toward the stationary part; and, by the aid of certain controlling wires and of a slow movement of the spindles, the finished yarn is wound upon the latter. Spinning is now completed.

Between the production of the yarn and the weaving of the yarn into cloth a few processes intervene which are mainly ancillary to weaving proper. The arrangement of the yarn must be changed so as to suit the weaving operation. To be sure, for the weft or filling yarn — that which will run across the completed cloth — the yarn as it comes from the mule is all ready. Without further treatment, it will fit into the shuttles of the loom. For the assembly of the warp yarns, however, winding, sizing, and warping, drawing-in, etc., are required. The yarn must first be wound upon small spools in order that it may be handled more easily. Then it is put through a bath of sizing or paste and water mixture, — a process called "dressing" or "slashing." By this immersion the yarn is made smoother, protruding fibres which might cause trouble in the weaving operation being consolidated with the rest of the yarn. Also some additional strength is imparted, and this is of particular importance since the weaving operation puts much strain upon the warp yarns. The final steps are the warping, drawing-in, etc. This group of operations covers the winding of the yarn upon the loom beam, — the large spool which is placed behind the loom, — the proper arrangement of the yarns in the warp according to a given design, the drawing of the yarns through the harnesses, and the mounting of the whole apparatus upon the loom itself. Everything is then ready for the weaving to begin.

In parenthesis we should note that other operations may be inserted between spinning and weaving, — for example, yarn-dyeing, twisting, and the like. In certain cases, especially when a stripe is desired in the finished goods, the wool is dyed when in the yarn, — a process which usually involves winding from the cop to skeins, the actual dyeing and drying, and then re-winding from skeins to spools. Twisting is called for only when two or more yarns are to be combined into a single strand. This process is not so largely employed in the woolen as in the worsted branch of the industry, although in the manufacture of specially heavy fabrics and of yarns to be sold to the knitting trade it is not infrequently used.¹

Weaving is the intermeshing of vertical and horizontal threads, a simple operation in theory but complex in detail. The variety of weave designs is almost infinite. In the simplest weave, the so-called plain weave, the warp threads, equally distant from one another, are divided into two groups. Threads numbered 1, 3, 5, etc., are drawn through the eyes of one harness, and the other threads through those of another.² Then in the weaving first one and then the other harness is raised while a line of filling thread is inserted. Thus the warp threads cross behind each shot of weft and so bind that yarn firmly into the growing cloth. Finally the consolidation of the fabric is increased by the beating of the reed against the weft thread as each shot of the latter is inserted.³ The

¹ The winding, twisting, etc., are all carried through on automatic machines — winders, twisting frames, and the like.

² A harness (or heddle, as it used to be called) is an oblong frame usually of wood. Between the longer sides are stretched gut strands or metal wires which hold metal eyelets half-way between the edges of the frames. These frames are mounted in the loom in front of the loom beam that holds the warp threads and behind the reed and the rest of the working apparatus of the machine.

³ The reed is a steel framework with many crossbars so set in the loom that these crossbars are perpendicular to the floor. The warp threads, after passing through the eyes of the harnesses, are also passed between crossbars of the reed, thence over the shuttle-race (over which the shuttle will move), and on to the cloth-beam in front of the loom. The reed therefore stands between the harnesses and the shuttle-race. It moves in a small arc, driving forward with much force after the shuttle has passed across the loom leaving a strand of filling yarn, and then falling back to await the next stroke. Its function is merely to "beat up" the cloth that is being woven — to force each new filling shot into close relation with that preceding. The old name for this device, the "batten," suggests this function better than the more modern term of reed.

There are differences as to the exact manner in which the harnesses are operated. Certain harnesses may be raised for *each* "pick," as I have suggested above, and then lowered into an intermediate position to await the next division of the warp

cloth as it grows is drawn off upon the so-called cloth beam in front of the loom, and the weaving process is complete.

Diversity of weave is, as I have suggested, the complicating feature. The cloth design may call for more than one color of filling yarn, and then two or more shuttles are required. For the management of these shuttles the number of shuttle boxes at the sides of the loom must be increased, and mechanisms devised for the automatic operation of these boxes. A single box on either side of the loom is sufficient for plain weaving, and no device for raising or lowering the box is necessary. The picking-stick actuated by power merely drives the shuttle back and forth. But complicated design of fabric may necessitate the use of three, four, and even six boxes on either side, with a corresponding complexity of control apparatus.

But variation comes also in the arrangement of the warp. In place of the simple interlacing of the plain weave, a twill, sateen, or more complex cloth structure may be desired. This can be accomplished on the power loom only by increasing the number of harnesses — that is, by increasing the number of divisions of the warp threads, — or, in the extreme case, by arranging for independent control of the individual threads. While the number of harnesses remains no greater than six, the weaving may be accomplished upon the so-called plain loom, — a machine in which the harnesses are operated by cams placed under, or lifting apparatus placed above, the apparatus.¹ Dobby or harness looms are employed for weaves which require seven to twenty-four harnesses. Here the control of the harnesses is secured by an auxiliary threads; or a harness once raised may be held up during two or more picks, in accordance with the demands of the design. The machine incorporating the former method of operation is called a "closed-shed" loom, while that run on the other system is known as an "open-shed" loom.

¹ The cam is an elliptical or heart-shaped piece of metal widely used in mechanical operations. It permits irregularity of action on the part of motions controlled by its periphery. In the case of the cam loom, the cams are mounted upon a revolving bar that runs across the loom down close to the floor; and the upright rods controlling the harnesses rest upon the edges of these cams. Each rod is held up by a single cam, and each cam is mounted on the crossbar in such a way that the high point in the ellipsis or the point of the heart comes at a different point in the bar's revolution. Accordingly, as the bar revolves, the harness-rods are raised and lowered seriatim, and so a series of varying divisions of the warp threads is made. Obviously there is a limit to the number of cams that can be mounted upon a single revolving bar; and therefore when a number of harnesses are needed — more than six — some other device must be employed to secure the various divisions of the warp.

device, such as a series of small perforated wooden bars on which the design is worked with pegs. These bars move in succession to a place on the side of the loom where they come in contact with wires attached to the harnesses. The presence of a peg opposite a given harness will raise it, absence of a peg will lower it (or leave it unmoved, according to the type of loom), and so the arrangement of the pegs upon each bar determines which set of warp threads will rise above and which will fall below a given shot of filling yarn. If, however, the cloth design is yet more complicated, the Jacquard mechanism for controlling each warp thread is called into play. This attachment is somewhat similar to the apparatus for controlling the harnesses of the dobby loom, except that perforated cardboard forms replace the wooden bars and that the presence or absence of a hole in the cardboard affects but a single warp thread. After each shot of filling a new form must be brought forward by the mechanism, placed upon the controlling apparatus, and so a new division of the warp effected. Obviously no limit is set to the intricacy of warp action if the Jacquard attachment is employed. Generally speaking, however, this device is not usually employed in woolen, nor indeed in worsted weaving. Plain and dobby looms comprise the normal equipment of wool-working mills.

While the plain, dobby, and Jacquard looms are the fundamental types of weaving apparatus as far as manipulation of the warp threads is concerned, another classification may be set up on the basis of the degree of hand labor involved in the control of the shuttle, viz., hand looms, power looms, and automatic looms. Hand looms, in which the shuttle is thrown back and forth by the weaver himself, are practically unknown now in the American industry. Power looms are the predominant form at present in the United States. Here the shuttle is driven across the loom and back by power, and, while the loom is in action, the operation of the picking mechanism is automatic.¹ The

¹ The shuttle is propelled across the loom by the action of the picking apparatus. In American looms this apparatus involves chiefly picking-sticks at either side of the loom. The lower end of each is fixed to a bar actuated by power, and the upper end, moving in the plane of the shuttle's traverse, strikes the shuttle when the latter has come to rest at its side of the loom, and drives it across to the other side.

Frequently foreign looms, and less often American looms, have a somewhat different picking mechanism, — an over-pick instead of an under-pick device. The over-pick mechanism carries an arm at either side of the loom, fastened above the level of the shuttle-race and actuated by power. Whereas the picking-stick of the under-pick apparatus stands substantially upright, the picking-arm of the over-pick mechanism extends out horizontally and moves in a horizontal plane. Attached to

weaver, however, has the task of seeing that the shuttle contains yarn and of stopping the loom from time to time to replenish the shuttle. The third type according to this analysis, the so-called "automatic" machine, relieves the weaver of this latter task. Two forms of this loom, both of recent origin, may be distinguished, the Northrop and the Crompton and Knowles machines. The Northrop loom, taken over from the cotton industry, is a single-shuttle apparatus, — that is, only one shuttle may be used at one time, — but the Crompton and Knowles machine permits the use of as many as four shuttles at once. Again, the number of harnesses that can be employed in the Northrop loom is limited to six — it is essentially a plain loom — whereas the Crompton and Knowles machine, being fundamentally a dobby loom, permits the use of many more harnesses. The Northrop loom, accordingly, is limited to the simpler sorts of weaving, while the Crompton and Knowles (according to its builders) is available for something over 90 per cent of the fabrics turned out in the wool manufacture. In either case, however, the mode of operation is similar. Both are bobbin-changing looms. As soon as the yarn on the shuttle-bobbin has been used up to a certain point, devices are set in motion which expel the exhausted or nearly exhausted bobbin from the shuttle and replace it with a new, full one. Of course the particular mechanism for effecting these movements differs in the two machines, since the one has a single shuttle and the other several shuttles to care for; but the purpose is the same in both. By the aid of these new machines, the task of the weaver is simplified. Now his chief duties are to repair breakages in the yarn (most looms now have mechanisms which stop the loom whenever either a warp or filling yarn breaks), and to see that the supposedly automatic operations of the machine proceed properly. Moreover, the production of the loom is increased, since the time previously lost in the replacement of bobbins is now saved. Automatic looms are increasing rapidly in number in the American wool manufacture and they promise to become a permanent feature of the domestic industry. On account of technical difficulties — especially the weakness of wool yarns — the future for automatic looms in woolen and worsted weaving does not promise the same degree of success that similar apparatus

the outer end of each arm is a leather strap, and this strap is connected with a wooden block that slides back and forth in a run-way behind the shuttle-boxes on either end of the loom. Alternately the picker-arms swing out, communicate action to the shuttle-blocks through the sudden tightening of the strap, and send the shuttle flying across the face of the loom. This method of operation is supposed to have advantages over the under-pick apparatus in developing the picking motion more gradually and in permitting a higher rate of speed in the action of the loom.

in the cotton manufacture has attained. But there unquestionably is a considerable place for this type of machine in wool-cloth fabrication.

After weaving comes finishing. The former may construct the fabric, but in a sense woolen cloth is "made" in the finishing. Often the goods come from the loom a loosely woven, sleazy fabric. This must be wrought into presentable form by the scouring, carbonizing, fulling, dyeing, napping, shearing, brushing, pressing, and other finishing operations. Scouring removes the sizing from the warp yarns and, if skillfully done, also clears and develops the colors (if the dyeing has been done in the fleece or in the yarn). However, dyeing is frequently done in the piece. The cloth may be dyed all a single color, or if cotton warps have been employed, a process called cross-dyeing may be used. In the latter the cotton yarn has been dyed in the yarn, and after the cloth is woven, the fabric is immersed in a type of dyeing material which will affect the wool but not the cotton fibers. Carbonizing is always used for woolen cloths (unless all the stock which went into the goods was carbonized already in the fleece) since bits of vegetable matter, especially the tenacious mestizo burrs, are likely to find their way into the woven fabric.

Fulling is a process peculiar to wool fabrics. Unlike cotton or silk fabrics, wool cloths will shrink heavily under treatment of water, soap, and pressure; and the texture is thereby much changed. The loosely woven goods produced by the weaving process become consolidated into firm, substantial fabrics. Much use is made of this property of wool cloths in the production of the woolen type of fabric. The operation is carried through in fulling stocks or milling machines. These mechanisms are fundamentally but large boxes at the top of which is a pair of rollers. The long piece of cloth as it comes from the loom is well soaked in a mixture of water and soap, and then run between the rollers of the fulling apparatus and tied end to end. It is so long that a large portion of it will be left lying in a heap below. The rollers draw up the heavily saturated fabric, press it, and then allow it to fall once more into the tub below, where it takes up any water squeezed out by the rollers. This operation is kept up until the cloth has shrunken in the degree desired and has become sufficiently knit together. And the shrinkage in width and length may be as much as a third of the original dimensions. Scouring in clean water will remove the soap from the fabric.

Napping and shearing are processes often employed jointly to a single purpose, the acquisition of an even nap or pile on the goods. The

napping machine is an apparatus consisting of one or more cylinders studded with pointed wires or covered with frames holding teazles, which are made to revolve at considerable speed.¹ The cloth is drawn under, over, or between the cylinders and as the wire points or teazles come into contact with the fabric, ends of wool fibers are loosened and raised from the body of the goods. Since such fiber ends are likely to be of uneven height, the cloth would have a rough appearance if the nap were not sheared to a uniform level. This is accomplished in the shearing apparatus. The latter consists essentially of a wheel of knives, — or more exactly of a group of cylinders covered with blades wrapped around them in the manner of the modern lawn-mower. The cloth is drawn under the cylinders set at a predetermined height; and thus the nap is cut uniformly. Sometimes, to be sure, the cloth is sheared without the preliminary napping, just to give a smooth appearance to the surface of the fabric.

Brushing, pressing, and the like are processes designed to give a good appearance to the surface of the finished goods. Brushing will raise up the short ends of fibers and give a dull appearance, while pressing will tend to bring out a sheen. Each operation is used until the desired finish is attained.

Other noteworthy operations which take place after weaving are burling and mending. These are used to remove any defects which have come in the weaving process, — defects due to the breakage of threads, the failure of the shuttle-control mechanism to function properly, and the like. All fabrics must be looked over and the defects marked. This is burling. Then the goods must be sent to the menders who attempt to correct the faults by the insertion of new threads, etc. Finally, before the goods are allowed to leave the mill, they must be inspected to be sure that all the work — mending, napping, shearing, and everything — has been done in the way that is called for by the specifications.

Not all woolen cloths require the elaborate treatment that is indicated by the foregoing description of finishing. Flannels, for example, are practically complete as they come from the loom. They may be scoured, dyed or bleached, burled, mended, and pressed; but on the whole these are not numerous operations as the woolen-cloth manufac-

¹ Teazles are the spiny heads of the plant *Dipsacus fullonum*. The spines are of just the strength to raise wool fibers from the woven wool fabric and to break off if they become enmeshed in the fabric too deeply. The heads, averaging about three inches in length, are arranged in frames that run across the operating cylinder of the napping machine. More generally, napping with the aid of teazles is called gigging.

turer views the situation. Many woolen fabrics, on the other hand, especially the so-called "face-finished" goods, undergo ten or fifteen operations, — all these that I have mentioned and frequently repeated nappings, shearings, pressings, etc. The uninitiated observer would, indeed, be astonished at the marked change in a melton, blanket, or broadcloth between the time that it enters and leaves the finishing department of woolen-cloth manufacture.

The Belgian System. Intermediate between the typical woolen and typical worsted methods of manufacture lies the so-called Belgian system of wool-working, — a system that takes its name from the place of its origin. The Belgian system aims at a fabric which will have some of the characteristics of both woolen and worsted fabrics. The chief difference springs from the method used in the carding operation. Whereas the woolen system proper by its Apperley intermediate feeding devices — and by other similar devices for transferring the wool between sections of the carding process — produces a somewhat confused mixture of the wool fibers, the transfer devices of the Belgian system aim at introducing as much parallelization as possible among the fibers. The short fibers are not eliminated as they are in the worsted manufacture, but the orderly alignment of the fibers does yield a yarn which has some of the characteristics of the worsted yarn. As the yarn, on the other hand, not only is produced chiefly on the woolen machinery but also has the fullness and bulkiness of the woolen strand, it obviously is something of a hybrid article.

As yet the Belgian system has small importance in the American industry. Only three or four mills use it, and there seems to be no tendency on the part of other mills to adopt it. The products have no peculiar value, although yarns manufactured on this system have a certain market in the knit-goods industry. Perhaps something can be done with the Belgian method in the future. At least it stands as an interesting cross between woolen and worsted systems of wool manufacture.

THE WORSTED-CLOTH MANUFACTURE

The description of woolen-cloth production has in part anticipated that of worsted-fabric manufacture, since some of the processes in the two are identical, or at least so similar in method that we need not consider differences of detail. The preliminary operations through scouring, the weaving, and many of the finishing processes may be included in this category. We may, then, turn our attention to carding, yarn-production, and certain operations unique to the worsted branch.

Carding is carried through in the latter manufacture in somewhat the same manner as woolen carding. The apparatus is not far different, except that there are always but two engines or parts (these of equal size), that the transfer apparatus between engines varies, and that the condenser methods are dissimilar. We need not go into such minor matters. The general purpose of the worsted carding is to loosen the individual fibers from one another, to mix them into a homogeneous mass, and to straighten them so that they lie more or less parallel to one another. Finally, the wool is drawn from the last cylinder of the carding machines in one large and continuous rope or strand, not in the individual ropings of the woolen condenser. The first stage in worsted yarn-production is then completed; but there remain two important steps, the removal of the shorter fibers from the mass of carded wool and the diminution and twisting of the remaining strand.

The first of these steps is the purpose of the combing operation. After the wool leaves the card, it is passed through two or more gilling boxes. These machines assist in the further parallelization of the wool fibers, and are merely mechanical adaptations of the motions that a woman makes in running a comb through her hair. Rollers deliver the wool upon a series of bars studded with long steel pins, which stick up through the strand of wool fibers and moving forward, convey the wool to another series of rollers. As the bars move forward more rapidly than the wool is delivered by the first pair of rollers, and yet less rapidly than the wool is drawn from them by the second pair of rollers, they act in substance as excellent combing devices.

The comb proper, whether of the Noble or of the French variety, — the types most frequently used in the American industry, — is a very complicated mechanism. Its chief function is to draw the strand of wool fibers through rows of up-standing pins that allow only the longer fibers to pass. There is this difference, however, between the two combs mentioned: a larger amount of the original stock of wool fibers is discarded by the Noble machine. More of the short fibers are retained if the French apparatus is used. A secondary function of combing is to carry further the process of parallelization, which is so distinctive of the worsted manufacture. The product is called the top, — a continuous strand or sliver of the longer fibers which have been straightened and laid parallel with one another. The shorter fibers that have been discarded — the noil — are turned over to the woolen branch of the industry. The top is subsequently submitted to one or two more gilling operations, and then is ready for the drawing processes.

Here we must begin to draw a distinction between the Bradford system of worsted-yarn production and the French or Continental method.¹ Let us examine the Bradford method first, since it is the one more largely employed in the United States. This method involves six or eight drawing operations upon flyer frames, and spinning upon cap, flyer, or ring frames, chiefly the cap frames. In the drawing operations, spools containing the roping or roving produced by the preceding operation are placed at the top of the frame.² The slivers from two to four spools are combined to form a single strand and this strand forms the basis of the treatment in that particular operation. In this way many combinations or doublings of the material are possible, by means of which greater uniformity of ultimate product is secured. The slivers or rovings are drawn from the spools by one set of rollers and passed on to another set which is moving at greater speed. By reason of the difference in speed of the two sets, the strand of wool fibers is elongated or drafted and reduced in size. From the second pair of rollers the material passes to spindles the revolutions of which impart twist. By the time the material has undergone the diverse drawing operations it has become a strand of relatively small diameter and has acquired considerable twist. It is almost yarn.

The spinning process, in which the final step is taken, is similar to drawing except that less emphasis is placed upon drafting and more on twist. The cap or ring type of spindle is particularly suitable for this end, since the number of revolutions per minute is much greater there than in the case of the flyer spindle. However, the flyer frame is useful for certain sorts of work, especially in the production of smooth yarns and in the working of hairs and English-breed wools.

Parenthetically the cone type of drawing may be described. This differs from the more usual, open method of drawing in the arrangements by which the speed of the spindle and the rapidity of winding-on are brought to proper relations one to the other. In open drawing the bobbin (upon which the roving is finally wound) is loose upon the spindle and is dragged around by the roving as it comes from the flyer-arm. For the proper performance of the drawing operation, a constant

¹ Possibly this discrimination between the two systems might be said properly to start with the combing process. However, nowadays in the American industry, it is a common practice to use both Noble and French combs in connection with drawing and spinning on the French or Continental methods.

² As the drawing proceeds and twist is imparted to the individual strand, the term by which this strand is called changes. Roving is roping with an increased amount of twist.

relationship must be maintained between the spindle-speed and the winding-on. As the bobbin fills up, the winding surface is increased and fewer revolutions are necessary to wind-on a given length of roving. But the weight of the bobbin also increases with the addition of material, and the bobbin will be dragged around less rapidly. Thus the desired constancy of spindle-speed to winding-on is attained. In cone drawing this rough-and-ready adjustment is eliminated. The bobbin is fast to the spindle, and a set of bevel gears adjusts the speed with which the material is fed to the spindle, to the amount of material already on the bobbin. If less is paid out by the drafting rollers, there is less to wind on the bobbin; and thus the constancy just mentioned is secured.

Let us turn to the French or Continental system. Here also there is a series of drawing operations and one spinning operation. But they are different in manner and product. The drawing processes are almost exclusively drafting, no twist being put into the strand. The material is drawn by one pair of rollers from another pair that is turning less rapidly, passes between rubbers which give a roundness or false twist, and then falls loosely into an open can. The same doublings are made as in the Bradford system and ultimately a roving of about the same diameter is secured. The roving comes to the spinning operation, then, a tenuous strand of parallelized fibers held together only by the false twist acquired from the last set of rubbers.

The actual spinning consists here as in the Bradford system chiefly in the introduction of twist; but this is accomplished upon the mule type of spinning apparatus in the French system of yarn manufacture. Unlike the woolen mule, to which it of course bears a family resemblance, the worsted mule has two sets of rollers and drafts the roving before any twist is imparted. On the other hand there is no spindle-draft in the worsted process: roving is paid out by the rollers as long as the carriage of the machine is moving in its outward traverse.

Because the drawing proceeds without the introduction of twist, the yarn produced upon the French system is of a fuller, softer character.¹ On the other hand, it lacks the tensile strength and durability of the yarns made on the Bradford system. Each is suitable for certain uses, one for the more delicate dress-goods and the like and the other for heavier men's-wear serges and similar fabrics.

There remains yet to speak of certain variations from the usual worsted processes for yarn manufacture; the treatment of English-

¹ If French combs are used, a larger proportion of the short fibers are left in the top and so an additional softness of yarn is secured.

breed wools, mohair, camel's-hair, and the like; and the Vigoureaux printing process. In the first place, especially in the working of the long English-breed wools, the process of combing may be omitted. The average length of fiber is so great that there is no necessity of eliminating the short-staple element. The wool is merely straightened in a series of gill-boxes, and then sent to the drawing operations. Again, in the manipulation of these wools and hairs, combing machines, if used, must be of a type different from the Noble machine so widely employed in the treatment of merino and crossbred wools. The Lister apparatus is the one usually employed. Finally, there is sometimes a variation in the importance of top and noil, respectively, in the case of certain hairs. The long, coarse fibers of camel's-hair top, for example, are serviceable chiefly in the manufacture of the press-cloths used in expressing vegetable oils. The softer noils go into overcoatings, yarns for the knit-goods trade, etc. Combing here is a means of making a discard quite contrary to that usual in the wool-working industry.

Vigoureaux printing is a relatively modern method of producing uniform yarns of light shade. The more usual method still employed in the manufacture of such yarns is to dye a certain proportion of the wool while it is in the loose form and then to mix this dyed element with a sufficient quantity of undyed material to yield the desired blend of color in the yarn. The Vigoureaux method accomplishes the same end by printing the wool after it has been combed. The top is drawn under a cylinder which stains it in cross-hatches, the breadth of the stain determining the depth of the color in the finished yarn. The doublings of top, sliver, and roving in the several drawing processes give the mixture of fibers necessary for uniformity of color in the final product. By this general method, not only is there an economy of dyeing material, since the noil has already been discarded, but a better blend of color is possible, since portions of fibers as well as whole fibers are stained.

Subsequent to the production of yarn, the worsted-cloth manufacture does not differ materially from that of woolen fabrics, at least in general theory. More frequently than in the woolen branch, warp yarns are made of doubled strands. The speed of worsted looms is greater than that of woolen looms. And the finishing operations in the worsted branch are less determinant of the appearance of the completed fabric. These processes of fulling, napping, and the like are carried on with much less vigor, and they are employed mainly for the purpose of bringing out the colors of the constituent yarns and to smooth the appearance of the fabric.

APPENDIX D

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